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THE GENUS *ESAKIA* LUNDBLAD WITH TWO NEW SPECIES (Heteroptera, Gerridae)

HERBERT B. HUNGERFORD AND RYUICHI MATSUDA[1]

Dr. O. Lundblad, in 1933, described this genus for his new species *E. ventidioides,* which was represented by a single adult male from Sumatra (Archiv für Hydrobiologie, 1933, Suppl., Bd. XII, Tropische Binnengewässer IV, pp. 401-405, Fig. 129, Taf. XII).

Through Dr. Lundblad's kindness we have been able to examine the above type in connection with our generic revision of the Gerridae and have discovered two new species that belong to this genus. One of these, represented by thirty-four apterous specimens, was collected by Captain L. C. Kuitert while on duty in Burma and presented to the entomological museum of the University of Kansas. The other species, represented by ten specimens, four of which are winged, was collected by Dr. R. L. Usinger in the Philippines and sent to us for determination. Unfortunately not one of the winged specimens shows a perfect hemelytron and three of them have mutilated wings.

The genus *Esakia* Lundblad is closely related to *Ventidius* Distant, from which it differs in ways that will be indicated in a forthcoming paper on that genus.

Esakia kuiterti n. sp.
(Pl. I, left. Pl. II, fig. 1, A to F)

Size: Apterous males: 1.93 mm. to 2.14 mm. long; 1.3 mm. to 1.43 mm. wide. Apterous females: 2.1 mm. to 2.48 mm. long; 1.6 mm. to 1.76 mm. wide.

Color: Predominantly black. Head with a pair of reddish brown, more or less triangular spots converging at base. Pronotum usually with a small median yellowish or reddish brown spot behind anterior margin. Mesonotum of males with a more or less triangular whitish spot, that of the females larger and nearly crescent. Antennae, except base of first segment, and legs dark. Venter usually pale.

Structural characteristics: Short, broad, somewhat flattened insect. Antennae as long as body in males, shorter in females. Antennal formulae: 1st: 2nd:3rd:4th::50:16:16:15 in male and 40:14:16:14 in female; in male third segment dilated, with basal peduncle and marginal stiff hairs, and fourth segment with marginal stiff hairs in basal region; in female these segments are slender and simple. Rostrum extending slightly beyond prosternum. Pronotal length: head length::25:40. Anterolateral margins of pronotum covered by eyes. Mesoacetabular region exposed laterad of metaacetabula. Metaacetabula with dorsal posterior margin oblique, apical lateral angle

[1] Contribution No. 991 from the Department of Entomology, University of Kansas. This report is a by-product of a project conducted with the aid of a grant from the National Science Foundation.

produced and paler in male. Mesosternum with posterior margin broadly concave. Small transverse metasternum with distinct omphalium. Abdomen strongly narrowed posteriorly. Anterior margin of first tergite often obliterated, broadly rounded when recognizable; anterior margin of second tergite strongly roundly produced anteriorly; seventh tergite, in both sexes, much longer than sixth tergite, broadly rounded on apical margin, ventrally broadly concave on apical margin and much longer than the preceding segment in both sexes. Male paramere as illustrated in plate II, fig. 1, E, F.

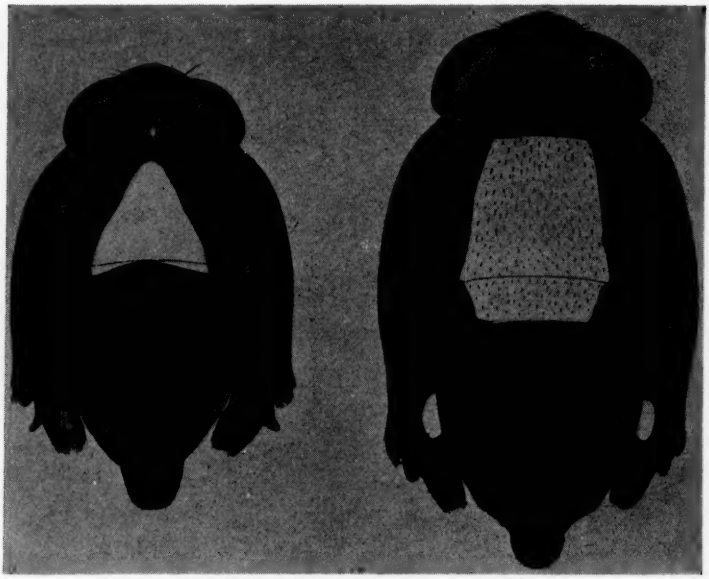

PLATE I

Left, *Esakia kuiterti* Hungerford and Matsuda, male. Right, *Esakia usingeri* Hungerford and Matsuda, male.

The relative lengths of the leg segments of a male:

	Femur	Tibia	First tarsal	Second tarsal
Front leg	150	120	8	32
Middle leg	435	310	120	21
Hind leg	480	130	23	33

Location of types: Described from 14 males and 20 females bearing the label "Tingkawk, Burma, V—1944, L. C. Kuitert." Holotype, allotype, and paratypes are in the Francis Huntington Snow Entomological Museum, University of Kansas.

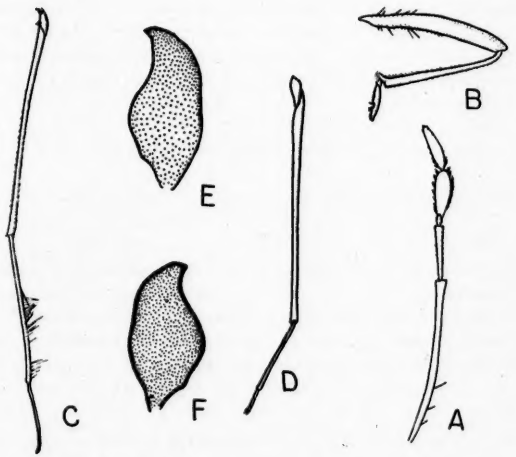

Fig. 1 Esakia kuiterti Hungerford and Matsuda

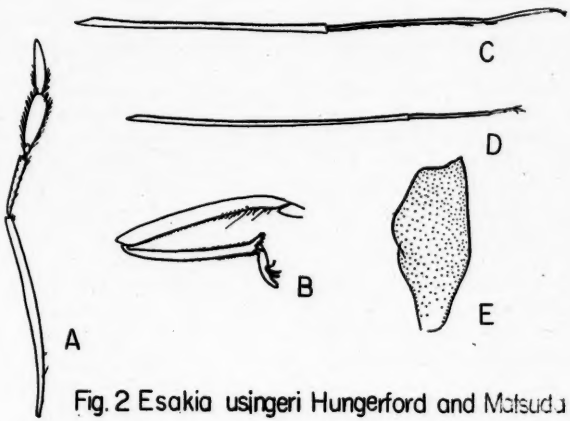

Fig. 2 Esakia usingeri Hungerford and Matsuda

PLATE II

Fig. 1, *Esakia kuiterti* Hungerford and Matsuda. A, male antenna. B, front leg. C, middle leg. D, hind leg. E, left paramere, outside view. F, left paramere, inside view.
Fig. 2, *Esakia usingeri* Hungerford and Matsuda. A, male antenna. B, front leg. C, middle leg. D, hind leg. E, left paramere, outside view.

Comparative notes: When first received by the senior author he considered these specimens to be *Esakia ventidioides* Lundblad. However, after examining the type of Lndblad's species we are convinced that it is specifically different. The apical lateral angle of the metaacetabula is not so sharply produced in the male and the antennal and leg segments are differently proportioned.

Esakia usingeri n. sp.
(Pl. I, right. Pl. II, fig. 2, A to E)

Size: Apterous males: 2.73 mm. long; 1.64 mm. wide. Apterous females: 2.94 mm. long; 1.76 mm. wide. Winged male: 3.36 mm. long; 1.68 mm. across humeri.

Color: Apterous forms black with a large conspicuous quadrangular whitish spot covering much of meso- and metanotum. Winged forms black without the above spot. Both forms have two reddish brown triangular spots on head and usually a roundish one on anterior lobe of pronotum. Also a conspicuous whitish spot on each meso- and metaacetabulum. Antennae, except base of first segment, and legs black or brownish black. Venter brown to black.

Structural characteristics: Relatively a little narrower than preceding species. Antennae as long as body in male, shorter in female. Antennal formulae: 1st:2nd:3rd:4th::65:18:20:18 in male; 50:16:18:17 in female; in male third and fourth segments are modified as shown in illustration. Rostrum reaching base of prosternum. Pronotal length: head length::30: 50. Anterolateral margin of pronotum covered by eyes. Mesoacetabular region somewhat constricted, only slightly exposed laterad of metaacetabula. Metaacetabula with dorsal apical margins oblique, without projection at outer apical angle in either sex. Posterior margin of mesosternum strongly concave; metasternum small, transverse, subtriangular, not reaching to metaacetabular region laterally, bearing distinct omphalium at middle.

Abdomen subtriangular in shape, narrowed apically, with anterior margin of first tergite broadly produced, anterior margin of second tergite strongly roundly produced, much longer than either first or third segment. Seventh tergite much longer than sixth tergite in both sexes, posterior margin broadly rounded. Connexivum obliquely reflexed. Ventrites strongly reduced in length, seventh ventrite much longer than the preceding one. In male eighth segment cylindrical, dorsal apical margin broadly rounded. Pygophore well exposed beyond ventral margin of eighth segment. Paramere as shown in Pl. II, fig. 2, E.

The relative lengths of leg segments of a male:

	Femur	Tibia	First tarsal	Second tarsal
Front leg	170	140	10	42
Middle leg	490	310	140	27
Hind leg	550	160	26	40

Location of types: Described from 6 males (3 winged) and 4 females (1 winged) bearing the labels "Montalban, P. I., VII 24, 1936, R. L.

Usinger collector." Holotype male (apterous), allotype female (apterous) and 5 paratypes are in the Usinger collection and 3 paratypes are in Francis Huntington Snow Entomological Museum, University of Kansas.

Comparative notes: This species is a little larger than the other two species and the whitish spots on the acetabula distinguish it from the other two.

The three species of *Esakia* can be separated by the following key:

1. Meso- and metaacetabula each with a whitish spot. Metaacetabula without projection at outer apical angles in male ..... *E. usingeri*
   Meso- and metaacetabula black. Metaacetabula with projection at outer apical angles in male 2
2. Middle leg with tibia more than three times as long as its first tarsal segment. Third antennal segment considerably longer than second in male (30:22.5) ..... *E. ventidioides*
   Middle leg with tibia less than 2.6 times as long as its first tarsal segment. Third antennal segment little, if any, longer than second in male ..... *E. kuiterti*

A NEW SPECIES OF *EURYTOMA* ILLIGER, PARASITIC ON THE NANTUCKET PINE MOTH, *RHYACIONIA FRUSTRANA* (COMSTOCK) AND THE EUROPEAN PINE SHOOT MOTH, *R. BUOLIANA* (SCHIFFERMULLER) (Hymenoptera:Eurytomidae; Lepidoptera:Olethreutidae)[1]

ROBERT E. BUGBEE
Allegheny College, Meadville, Pa.

The new species, described below, has been masquerading under the name of *Eurytoma tylodermatis* Ashmead (1896). In preparing the description and distribution notes I have examined several hundred specimens labelled *E. tylodermatis* which had accumulated in the U.S. National Museum collection and an extensive series from the collection of the Department of Agriculture, Ottawa, Canada. Both collections yielded a number of specimens on which this new species is based.

Eurytoma pini, n. sp.

FEMALE. Black. Length aver. 4.5 mm. (3.9-5.2). Abdomen oval from the side; slight lateral compression; aver. in length 2.5 mm. (2.1-2.8); dorsal extension of abdomen anteriorly not abrupt; sixth segment wide, aver. .72 mm. (.60-.87) at widest point; its width 28% length of abdomen; lateral lower surface of the sixth covered from anterior to posterior margin with fine shallow pits that extend over dorsal surface of segment in a narrow band confined to anterior margin; part not pitted, smooth and shiny black. Ninth segment stout and elongated; aver. .28 mm. (.25-.32) in length. In-

[1] Aided, in part, by a grant from The National Science Foundation, G 4319.

ternal genitalia elongate; aver. in length 2.2 mm. (1.8-2.5) and in height 1.1 mm. (.80-1.2); dorsal valves narrow to medium in width for horizontal length; proximal end turns dorsally at less than a right angle; ventral valves extend dorsally only a little above dorsal valves and expanded anterior plate has an aver. width of .21 mm. (.15-.22); stylet arch in an oblique plane. Propodeum broadly concave with a shallow, wide, median furrow that may be distinct in upper one third to one fourth but fades out ventrally; furrow widest at top; flat carina across top of furrow; lateral carinae in upper one third only; areas lateral to furrow finely punctate and irregularly ridged. Tegulae black. Scape of antennae most often with outer face yellowish-brown; less often with upper one half or less brown to black, rest yellowish brown; segments of flagellum truncate distally; first segment about one and one-half times as long as wide; 2-5 becoming progressively shorter so that 5 is approximately square; segment 6 closely applied to terminal segment, but separated by a distinct annulation; antennae short and stocky in appearance. Legs with coxae black; black to dark brown on all femora; brownish tinge on middle of outer face of fore tibiae; brown to black encircles middle and hind tibiae; knees and apices of femora and tibiae yellowish brown. Wing veins yellow; marginal vein linear; marginal and postmarginal often equal in length; marginal aver. .35 mm. (.30-.40) and postmarginal aver. .33 mm. (.25-.40) in length; stigmal club small and rounded basally.

MALE. Aver. in length 3.0 mm. (2.6-3.1). Scape of antennae black or dark brown except yellowish brown base; first segment of flagellum about twice as long as wide and covered with long white hairs; segments 2-5 progressively shorter, although length usually exceeds width, and with two whorls of long hairs; segments 6 and 7 closely applied together and covered with short hairs; diameter of segments decreases distally. Legs with dark brown to black on all femora and middle tibiae; apices and knees yellowish brown. Wing veins yellow, linear; marginal aver. .30 mm. (.27-.32) and postmarginal aver. .28 mm. (.27-.30) in length.

Types. 2 females and 3 males. Holotype female and allotype male in the U. S. National Museum. Additional specimens in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality. Washington, D.C., A. D. Hopkins coll., 13913, and 13913 a' Hopk. U.S.

Host. Reared June 24, 28, 29, and July 1, 1915 from *Evetria* (=*Rhyacionia*) sp. in *Pinus Banksiana* and *P. sylvestris.*

Range. Throughout the pine growing regions of Canada and the United States, from southern Quebec, Ontario, Manitoba, Saskatchewan and British Columbia, south to Maryland, Virginia, Missouri, and Nebraska. Eventually records should extend its range into the Northwestern states.

Additional localities and hosts. NEW YORK: Groton Falls, *Rhyacionia rigidana* (Fernald); Long Island, *Evetria* (=*Rhyacionia*) *buoliana* (Schiff.) on *Pinus sylvestris;* Great Neck, *Evetria* (=*Rhyacionia*) *buoliana* on *Pinus sylvestris* and Scotch Pine. PENNSYLVANIA: Reading; Mt. Alton, from *R. frustrana.* WEST VIRGINIA: Kenewha Station from *R. rigidana* on *P. sylvestris.* VIRGINIA: Falls Church, from *Evetria* (=*Rhyacionia*) *frustrana* (Com-

stock) on *P. virginiana;* Richmond from *R. frustrana.* MASSACHUSETTS: Sharon Heights, on *P. magnus* and *P. rigida.* NEW JERSEY: Medford from *R. frustrana;* Moorestown from *Glypta cocoon* and *Epiblema strenuana* (Wlkr.). CONNECTICUT: East River, *Acrobasis rubrifasciella* on Alder. MARYLAND: Beltsville, from *R. frustrana;* Easton, from *Thyridopteryx ephemeraeformis* (Haw.). MISSOURI: St. Louis, from Pine Shoot Moth larva; Midway, from Tip Moth; Columbia from Pine Tip Moth. NEBRASKA: Halsey, from *R. bushnelli* on *P. ponderosa* and *P. diverticulata.* OHIO: Springfield, from *Epiblema strenuana* on *Ambrosia;* St. Clairsville, from *E. strenuana* on *Ambrosia;* Wooster, from Ragweed; Ottawa County from Ragweed. MICHIGAN: Erie, *Eucosoma scudderiana.* CANADA. ONTARIO: Doone, Maidstone, Mansfield, Aberdeen, Uxsbridge, Loretto, New Lowell, Perkinsfield, Niagara Falls, Hanover, Lorraine, Toronto, Hamilton, Kitchener, Peel Co., Normandale, Bowmanville, Burlington, London, Breslau, Port Nelson, Oakville, Port Weller, Leamington, Brighton, Petrolia, Chinquasousym from *R. buoliana.* BRITISH COLUMBIA: Surrey, from *R. buoliana.* MANITOBA: Aweme, from *R. buoliana* on spruce. QUEBEC: Westmount, from *R. buoliana.*

In the following articles reference is made to parasites bred from *Rhyacionia frustrana* (Comst.) and *R. buoliana* (Schiff.) (Nantucket Pine Moth and European Pine Shoot Moth) as *E. tylodermatis.* They probably should be the new species described herein.

> Graham and Baumhoffer (1927), Cushman (1927), Sheppard (1933), Friend and West (1933), Friend and Hicock (1936), Underhill (1943), Miller (1953), and Miller and Neiswander (1955).

This species is quite variable and probably contains several subspecies. Unfortunately, most of the series consisted of one or two specimens only, so that definition of subspecies is impossible.

The species is widespread, occurring wherever pine and its most consistent host, the Nantucket Pine-Moth, *Rhyacionia frustrana* (Comstock), are found. In addition it has been bred from other lepidopterous hosts including: the European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff); the Bagworm, *Thyridopteryx ephemeraeformis* (Haw.); the Ragweed Borer, *Epiblema strenuana* (Wlkr.); the Lima Bean Borer, (*Etiella* sp.); and the Pink Bollworm, *Pectinophora gossypiella* (Saund.). No host is definitely stated for many of the breeding records from Ragweed (*Ambrosia* sp.). Although not as host restricted as most of the eurytomids, this species seems to be limited to lepidopterous hosts whose larvae mine or bore in plant tissue.

Although it is most often recorded as a primary external parasite of the larvae of *R. frustrana* (Comstock), and *R. buoliana* (Schiff.), it may occasionally act as a secondary parasite (Cushman, 1927 and Miller, 1953). Its importance as a primary parasite of *R. frustrana* is considerable, as Cushman (ibid.) points out that it was the "most abundant parasite in the 1924 rearings." Other hosts of the parasite, listed above, may represent alternate hosts as *R. frustrana* has only one generation a year in the Lake States and Black Hills, while in the South there may be three or, possibly, four (Graham, 1939).

Emergence. Emergence of the parasite may begin as early as April (Eastern Maryland) in the southern part of its range and continue into early September (September 8, Springfield, Ohio). The bulk of the emergence occurs during June, July and August. For emergence dates in Ohio see Miller, 1953.

This new species seems to be nearest to *Eurytoma bolteri* Riley and *E. tylodermatis* Ashmead. It can be told from *E. bolteri* by its smaller size; more dorsal extension of the dorsal and ventral valves of the female genitalia; heavy and more extensive sculpturing of the sixth abdominal segment; the less well-developed median furrow on the propodeum; the fact that the ocellocular line is equal to the diameter of the lateral ocellus; and the shorter first funicle joint.

It differs from *E. tylodermatis* in being on the average larger; more extensive sculpturing on the sixth abdominal segment; longer exposed tip of the ninth abdominal segment; narrower horizontal portion of the dorsal valves; more extension dorsally of dorsal and ventral valves; and the lack of a complete, well defined median furrow on the propodeum.

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CORN EARWORM MOTH REPELLENTS[1]

JAMES E. ROBERTS[2] AND L. H. ROLSTON[3]

Most efforts to control corn earworm are directed against the larval stage. Their effectiveness is apparently determined to a large extent by the infestation potential. Measures that succeed when few eggs are deposited on each silk mass fail when eggs are numerous. Therefore, some means of

[1] Published with the permission of the Director of the Arkansas Agricultural Experiment Station.

[2] Now at Georgia Agricultural Experiment Station, Experiment, Georgia.

[3] University of Arkansas, Fayetteville, Arkansas.

reducing the infestation potential might be very useful. To this end, an investigation of several possible adult repellents was conducted in Arkansas in 1955 and 1956.

The selected materials were screened in a plywood cage 33 inches square by 18 inches high. Each side of the cage was provided with two 12 × 12 inch openings covered with muslin. For convenience, the muslin was tacked to wooden frames which fitted into slots on each side of the openings. Caged moths, attracted to these sources of light, oviposited freely on the muslin. To avoid possible fuming action, air was forced outward through the muslin panels by a 6-inch electric fan mounted over a screened opening in the cage top. The fan was shielded in a manner to admit air, but not light, from outside the cage.

Several materials were selected, mostly from a list compiled by King (1954), that had shown repellency to some insect or tick. Cloths were treated in a 10 per cent solution of the material under test, and a treated and untreated cloth exposed on each side of the cage. Variable numbers of moths, trapped at a mercury vapor light, were used during the tests. The criterion for repellency was the relative number of eggs deposited on the treated and untreated cloths after one night of exposure. Any cloths showing repellency were saved and exposed to oviposition again at intervals. Observations were also made for ovicidal action of materials used.

Of 20 materials tested, 6 exhibited significant repellency against corn earworm moth oviposition. The results given by these materials are presented in table 1. Materials tested which exhibited little or no repellency were:

N-ethyl acetanilide
di-N-butyl adipate
benzyl benzoate
cinnamic acid
2-phenyl cyclohexanol
2,3,4,5-bis (Δ^2-butenylene) tetrahydro furfural[4]
butoxypolypropylene glycol[5]
2-ethyl 1,3-hexanediol
dibutyl phthalate
isobornyl thiocyanoacetate[6]
N,N-diethyl-m-toluamide[7]
N-hexyl benzoate
caprylic acid
diphenyl carvonate

One of the materials that showed promise in cage tests, N-butyl lepidone,[8] was formulated from the technical material as a 10 per cent spray and field tested in small plots. A single application at 30 per cent silking reduced the average number of eggs per silk on a 10-ear sample from 29.5 to 19.4. Two applications, the second 3 days after 30 per cent silking, further reduced the count to 2.0. However, the single application interfered with pollination, and two applications almost completely prevented pollination.

[4] Phillips R-11, Phillips Petroleum Co.
[5] Crag fly repellent, Union Carbide Chemicals Co.
[6] Thanite, Hercules Powder Co.
[7] Supplied through the courtesy of Carroll N. Smith, Orlando Laboratory.
[8] Compound 7493, Union Carbide Chemicals Co.

In greenhouse tests, phytotoxicity was evident after 24 hours at concentrations of 1, 3 and 5 per cent.

A 49.5 per cent emulsifiable concentrate of N-butyl lepidone provided by the manufacturer gave poor and inconsistent results in cage tests at concentrations ranging from 0.25 to 6 per cent by volume. Addition of 1 part of this emulsifiable concentrate to 99 parts DDT mineral oil spray ruined most ears in the field test and did not improve control. A 3 to 1 mixture of 5 per cent N-butyl lepidone and 10 per cent DDT dust applied to silks with a puff duster caused no obvious phytotoxicity but again did not improve control.

Undecenoic acid was retested at concentrations of 1, 2, 4 and 6 per cent by the cage method. Only the two higher concentrations showed significant repellency. The same concentrations in the field gave barely significant reductions in the number of earworm eggs. Treated plants were severely burned, especially at the higher concentrations.

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TABLE 1.—Repellency to earworm moth oviposition in cage

Material	Residue Age in Days	Number Eggs on Check	Reduction Per cent from Check	Amount of Hatch
N-butyl acetanilide	2	57	89	None
	5	162	6	None
	8	170	31	Most
	11	743	44	All
	26	215	67	None
	29	481	58	Most
N-butyl lepidone	2	284	100	None
	4	263	72	Few
	7	151	86	Few
	10	832	83	Few
	25	143	43	None
	28	334	75	None
Dimethyl phthalate	2	195	82	None
	4	154	54	Few
	7	134	13	Few
	10	641	35	Few
	25	184	61	All
	28	210	35	All
2-butyl 2-ethyl 1,3-propanediol	2	194	64	All
	4	211	34	All
	7	45	0	All
	10	1194	44	All
	25	173	24	All
	28	338	13	All
Tat[a]	2	649	71	.....
Undecenoic acid	2	585	81	Most

[a] Product of O. E. Link Co. Inc., dimethyl phthalate 75% and dimethyl bicycloheptene dicarboxylate 25%.

A CONTRIBUTION TO THE BIONOMICS OF *LESTRIMELITTA CUBICEPS* (Hymenoptera, Apidae)

VIRGILIO DE PORTUGAL-ARAÚJO
Caixa Postal 2968-C, Luanda, Angola (Africa)

INTRODUCTION

The genus *Lestrimelitta* Friese of the tribe Meliponini contains but three known species: *Lestrimelitta ehrhardti* (Friese), *L. limão* (F. Smith) and *L. cubiceps* (Friese). This genus is considered by several workers as being quite specialized, suggesting a recent origin. If this were the case, the geographical distribution ought to be restricted, occupying only one continent. However, *L. cubiceps* is found in Africa and the other species in tropical America, especially in southern Brazil. The South and Central American species of this genus are essentially thieves, making their living robbing certain species of *Trigona,* especially of the subgenera *Plebeia* and *Nannotrigona.*

A bionomic study of the African *L. cubiceps* Friese is of interest not only in itself but for its possible significance in judging genetic relationships with the American species. One would think the placement together of American and African species likely to be artificial.

MATERIAL AND METHODS

The colonies of *Lestrimelitta cubiceps* studied were found in Zanzo, district of Luanda, Angola (Portuguese West Africa), inhabiting cavities in branches and small trunks of trees, and were transferred to special observation hives. One observation of an assault for obtaining new quarters was made in which I did not know the location of the *Lestrimelitta* colony.

Pillages for detailed study were provoked in 1955 by putting a strong hive of *L. cubiceps* Friese fifty meters from three hives of *Trigona (Hypotrigona) braunsi* Kohl,[1] variety *cassusso.* These three hives were part of a meliponary in Luanda that contained several hives of *Trigona (Meliponula) bocandei* Spinola, *Trigona erythra togoensis* Strand, *Trigona (Hypotrigona) braunsi* Kohl varieties *landula* and *cassusso,* and *Trigona lendliana* Friese.

The interiors of the attacked hives were examined during and after the pillage operations. After a series of observations had been made with the above arrangement, the hive of *L. cubiceps* Friese was moved to a point 600 meters from the meliponary and the attacks stopped, suggesting that 600 meters is beyond the flight range of this species.

In 1956 this *Lestrimelitta* colony was divided and the daughter hive was put ten meters from the others, in the same meliponary, for complementary observations.

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[1] *Trigona (Hypotrigona) braunsi* Kohl has often been identified as *T. (H.) gribodoi* Magretti (e.g., by Portugal-Araújo, 1955) but these species are different as shown by Guiglia (1955). There are some hints that the varieties bearing the native vernacular names *cassusso* and *landula* are two cryptic or sibling species; therefore they will be referred to separately in this paper.

OBSERVATIONS ON THE NESTS

There are no horizontal combs. The brood cells are in clusters, sometimes united by small wax columns 1 mm. in diameter but usually they simply touch one another (fig. 1). Generally the construction of the cell cluster is from the top towards the bottom. The form of the cells is not as perfect as in the other African species (Portugal-Araújo, 1955a); the workers make excessive use of cerumen in building, giving the cells a coarse and irregular aspect. The size of the cells is quite variable: 3.5 mm. high × 2.5 mm. in diameter or 3.5 mm. × 3.0 mm. to, exceptionally, 4.00 mm. × 3.5 mm. The queen cells (fig. 1) average 4.5 mm. high × 3.5 mm. in diameter. Queen cells were observed in only one colony in September, 1956, and January and February, 1956. The total cluster of cells in the strong hive was 10 cm. × 6 cm. Sometimes the summit of a cell shows double vortices of markings (fig. 2).

Honey and pollen are kept in small dark brown waxen pots, coarsely made, having walls in common (fig. 3). As with the cells, there is an excessive use of wax in the pots, the external walls of a group of pots being smoothed out due to the addition of wax or cerumen between nearby exterior pots or by the construction of small interstitial empty pots. Each individual pot averages 6 mm. high by 5 mm. in diameter. The volume of the pots taken together is rarely larger than the volume of the cluster of brood cells.

The entrance to the nest is a tube 4 mm. in internal diameter and about 5 cm. in length with walls 3 mm. thick, built with thick propolis (figs. 5 and 6). Usually one finds two or more guard bees that retire into the nest at any disturbance by the observer. The bees close the entrance after sunset and reopen it again two to three hours after sunrise. However, during pillages the entrance is open earlier. Also, under special circumstances, for instance, lack of foragers or if the colony was molested on successive days, the entrance may be found closed for several days.

In all other species of Meliponini I know, the workers, when cleaning, fly out, dropping the waste material far from the hive. This does not happen here: the workers do not fly but abandon waste material at the mouth of the entrance tube. In case a horizontal surface holds the waste and this ferments or develops fungi the problem is solved by lengthening the entrance tube.

There is no protection of the brood by a membranous involucrum. There are, however, small, thick, semicircular sheets of cerumen, irregularly placed, attached to the bottom or sides of the nest (figs. 3 and 7). Possibly these are stores of cerumen. In the wild state in hollows in trees, the cell cluster is among the pots.

The pollen, like that of *L. limão* F. Smith, is kept in the pots as a liquid paste, that is pollen with a high percentage of liquid, perhaps honey. A small number of pots, five to ten, contains dry pollen without honey, but it does not have the normal aspect of pollen stored by other Meliponini and by *Apis*. I never saw these bees in flowers.

Honey is stored pure or mixed with pollen; it is pale or sometimes

dark. The honey of this species is not disagreeable, but it contains the strong odor of the workers, like cooked lemon skins or over-ripe lemons.

There are small deposits of propolis, usually in the corners of the hive. This propolis is quite soft and apparently is used by the workers in the assaults and pillages. Such deposits are found in nests of all meliponines observed but are thicker in *Lestrimelitta* than in others.

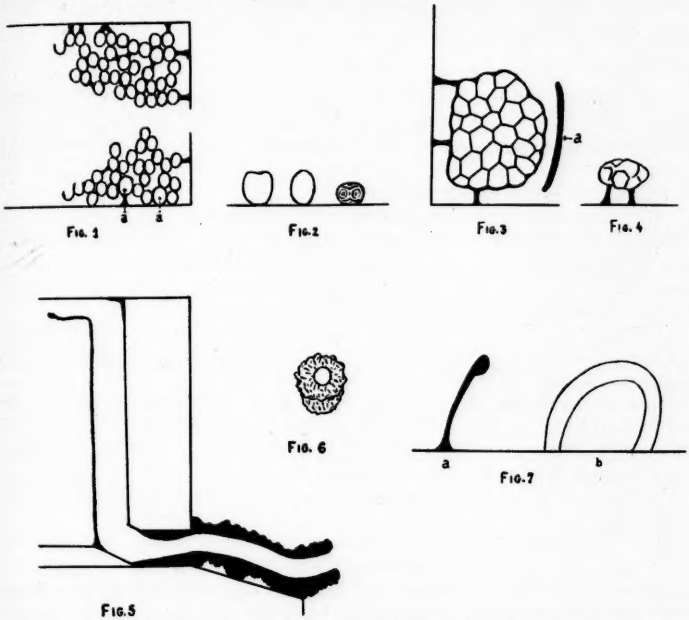

Fig. 1. Brood cells seen from the side showing their connection to top, side, and bottom of a hive of *Lestrimelitta cubiceps*. *a*, queen cells. Fig. 2. Brood cells, polar and lateral views. Fig. 3. Top view of a horizontal section of a group of pots. *a*, sheet of cerumen. Fig. 4. Side view of a group of pots being constructed. Fig. 5. Vertical section of the entrance tube of a colony in an observational hive. Fig. 6. Front view of the entrance tube. Fig. 7. Sheets of cerumen. *a*, one sheet seen in section. *b*, front view of a sheet.

Lestrimelitta colonies lodged in the author's hives (style of Nogueira-Neto, 1953) grew well if the hives were not opened too often. The nest was begun near the hive entrance and expanded into the interior, pots and brood cells being together in the body of the hive, with only rarely any construction in the drawers or honey trays of the hive.

As with most other meliponines, there is only one mated queen in each colony. The bees are not aggressive toward human beings, being in fact timid in the presence of a person. Nevertheless, when a colony is opened, a few workers take attitudes of defense, and workers close to the queen may raise their posterior legs and open their jaws as though to bite.

In moving colonies from the forest to observation hives one should be careful not to touch the queen with the fingers, for in this case, as in other meloponines, she may be balled soon after release and killed. In this operation, the cluster of pots is easily moved entire, because of the firm outer walls of the cluster.

The only data available on the ratio of workers to males concerns a sample of about 255 pupae obtained on September 27, 1956; of these, four were males, the rest workers.

ARTIFICIAL DIVISION OF COLONIES

I employed the method for dividing colonies suggested by Nogueira-Neto (1953:136-144). The strong colony was divided, royal cells and the cells with pupae being put in a new hive which was placed above the old nest. After a few days the mother hive was put far away, so that the foragers remained with the daughter hive.

It is interesting that, immediately after this division was completed, the daughter hive started a very heavy pillage of colonies of *Trigona braunsi* var. *cassusso*. Bees from the robbing colony would attack a *cassusso* colony daily for some days, sometimes eventually destroying it. During this time all the stored food was taken from the robbed hive.

The mother hive, full of honey but without foragers, remained with its entrance closed for several days. In fact, in the following 60 days I rarely saw a worker leaving the hive.

I want to mention the following observation: Such a division was made on September 27th, 1956, in the presence of Dr. Warwick E. Kerr, during his visit to Africa. Three queen cells were included in the daughter hive. I did not see when the first two queens emerged, but the third did so on December 9, 73 days later. Therefore the life cycle of these bees must be very long.

PILLAGE AND ASSAULTS

Among the African stingless bees that I know, only *L. cubiceps* Friese robs, assaults, or pillages other species to obtain food, cerumen and a place to live. Friese (1912) refers to this bee, "which after the manner of *L. limão* F. Smith of South America, attacks in a swarm the industrious species of *Trigona,* drives them away, and takes possession of their supplies of honey" (*apud* Schwarz, 1948). Only rare observations have been made on pillage of meliponine species other than *cubiceps*. However, I have seen robbing of honey by almost all species when one hive is being opened close by another. Also, *T. braunsi,* both varieties, rob cerumen and propolis from the entrances and cracks of nests of *Trigona bocandei.*

All the assaults and pillage of *L. cubiceps* were limited to nests of *Trigona braunsi* variety *cassusso,* a form that is smaller than *cubiceps*. I have never seen a real attack on variety *landula* notwithstanding the fact that in my meliponary there were always several colonies of *landula;* also, the colonies of *cassusso* were attacked repeatedly. However, Dr. W. E. Kerr (*in litt.*) observed in Tabora, Tanganyika, on October 9th, 11th and 12th, 1956, an attack on the variety *landula.* Kerr observed six colonies of *cassusso* and one *landula,* and all of them being attacked by *L. cubiceps.*

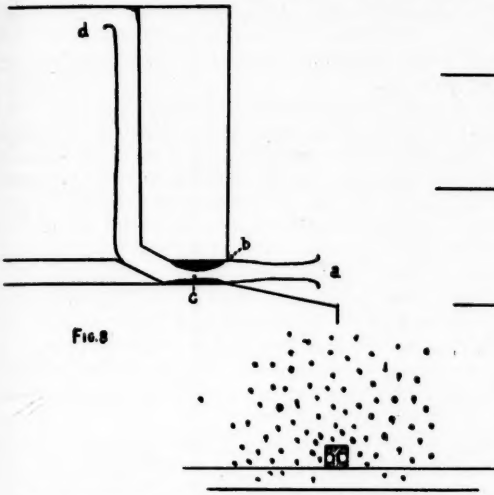

Fig. 8. Vertical section of the entrance tube of a colony of *Trigona (Hypotrigona) braunsi* Kohl, variety *cassusso*, in an observation hive. *a*, front entrance. *b*, base of the entrance tube, where it is destroyed by the attackers. *c*, narrow part of the entrance tube (the point that is difficult for the *L. cubiceps* workers to get traverse). *d*, inner opening of the entrance tube. Fig. 9. Horizontal section of the entrance tube of a colony of *cassusso*, in which one can see its double structure that hinders the entrance of attackers. Fig. 10. External view of the entrance of a hive of *cassusso* attacked by *L. cubiceps* showing the propolis dots transported by the attackers.

However, he further stated that this colony of *landula* had been recently moved from the woods, in the daytime; this had certainly caused a heavy loss among the field bees. I have also found more than once that if a colony of *cassusso* were being attacked and I moved it, the *cubiceps* workers became disoriented and tried to attack nearby colonies of *landula*, but these have the entrance tubes well defended by a great number of guards, so that the *cubiceps* usually give up. Kerr adds that in the attack on the variety *cassusso* the death rate of the victims was very low, but in case of the *landula* colony it was 180 to 250 adult bees. The queen was not molested, but very likely the hive would have been destroyed but for a new change of place.

In assaults on *cassusso* for pollen, honey, brood food and cerumen, the *Lestrimelitta* only kill the guards and the few other bees willing to fight. In case of an assault for establishing a new hive (swarming), the workers of *L. cubiceps* apparently look for a nest of *cassusso* and kill all the bees, including the brood and queen.

The assaults I have seen can be summarized as follows, in chronological order:

1. Two or three *cubiceps* are seen flying close to the entrance of a hive. It looks as though they were inspecting the base of the waxy entrance and its location in the tree.

2. A great number of defenders come out, flying close to the entrance tube.

3. The robbers increase their number and start to destroy the base of the entrance tube until it falls down.

While this phase is going on one very interesting thing happens: some honey is poured by the workers of *cassusso* from the inside into the remains of the entrance tube. This closes the entrance for all the bees remaining outside, both attackers and defenders. Usually the defenders and guards are slain. I found that the honey is actually poured by *cassusso* workers, and not by any attackers that happen to enter the hive.

4. The number of the attackers increases, reaching 40 to 60. A good number of these newcomers bring on their hind legs small pellets of a viscous propolis, apparently from the stores in the *Lestrimelitta* nest. This propolis is put around the entrance in an area of 2 to 3 cm. in radius (fig. 10). The role of this propolis has not been learned but it looks to be part of the method of attack; *braunsi* var. *landula* uses a similar method against attacks of ants. Interestingly it is common to see workers of other hives of *cassusso* starting to collect this propolis.

5. Foragers of *cassusso* and some defenders stay on the wall of the hive, close to the entrance, and occasionally fight the attackers. The *cassusso* are usually killed in any such encounters.

The honey that is poured in the entrance tube by the bees inside the colony is collected by the attackers.

6. At the end of the day the attackers (*cubiceps*) go home, the honey stops being poured, and the foragers of *cassusso* penetrate into their hive. During the night the entrance tube is rebuilt.

7. On the following morning the attackers come again to the *cassusso* hive. The guards make short runs and nervously beat their wings; some of them are killed by the *cubiceps* attackers. Some of the attackers penetrate the hive. At the same moment one sees the honey appearing again in the entrance of the *cassusso* hive and usually the robbers that have entered the hive come out cleaning themselves from this sweet bath. This honey flows and drips to the ground at rate of about one drop every 2 minutes; this may continue for 12, 24 or 36 hours, without stopping even at night.

8. The robbers after a while seem no longer interested in collecting the honey that pours out and try, without success, to open the entrance more widely. Also, more bees from other hives of *cassusso* appear to suck the honey being poured out and to collect the propolis that is continuously transported by the *cubiceps* workers from their hive to the entrance of the one being robbed. In the evening the robbers return to their hive and the defenders stay in the robbed hive grouped together on the front wall. This same situation may continue for one, two or three days (data for the observed hives).

9. After one to three days, without an indication that the situation will change, the honey stops pouring, the attacking *cubiceps* and the robbers from the neighboring *cassusso* hives suck up all the honey close to the entrance. (By the way, the *cassusso* robbers never get too close to the *cubiceps*.) Then the attackers enter the hive without any resistance being of-

fered by the *cassusso* bees. Soon after, *cubiceps* workers start coming out of the hive carrying propolis and cerumen on their legs, sometimes in such quantities that the legs are stuck together, while others have the abdomen swollen with honey or brood food. In this phase the robbers usually show no interest in honey. The entrance of the *cassusso* nest is divided into two very narrow openings (figs. 9 and 10), each only large enough to allow one bee to pass. It is probably for this reason that emerging *cubiceps* carrying propolis often get their hind legs stuck together for the narrow opening would push the legs toward one another. This entrance sometimes becomes obstructed with trash; in this case the guards clear it. After a number of *cubiceps* have penetrated the colony a group of robber guards is established in the entrance, as occurs during attacks of *L. limão* F. Smith on nests of *Trigona (Plebeia)* spp. and *Trigona (Nannotrigona) testaceicornis.*

10. When the *L. cubiceps* workers finish the pillage one can see in the robbed hive mutilated pots and larvae starving because the cells have been opened and brood food taken away. But, always, in my hives, there were still good quantities of stored pollen and honey left. The adult population is much diminished, but all young bees and good numbers of adults remain. Kerr, in his observations in Tabora, Tanganyika, did not find great mortality among the *cassusso* hives robbed. He also did not observe the defense by pouring honey, but all his hives had been moved from the forest to the laboratory only a day or two days before the attack started. They were, therefore, weak. I have also observed some attacks where honey was not used, but they were on hives weakened either because of lack of food or because of two, three or more previous attacks by *Lestrimelitta.* But all strong colonies that I had used honey when attacked.

It was observed that colonies of *cassusso* near those of *Lestrimelitta* often placed sand grains around the outside of the base of the entrance tube and narrowed the tube inside with the same material until only one bee could pass at a time.

CONCLUSION

The genus *Lestrimelitta,* to judge by its geographical distribution in America and Africa, looks to be an old group. Similarities in their robbing way of life support the idea that African and American species are related, their similarities not mere parallelisms. *Lestrimelitta cubiceps* Friese is more primitive than the American species in having the cells arranged in a cluster and not in horizontal combs as in the American species. Also, the presence of dry pollen pellets in some pots suggests the possibility that occasionally these bees collect pollen from flowers, although I have never been able to find one on a flower and there is no corbicula for carrying pollen. Of course there is a possibility that the workers transport the dry pollen in the mandibles, as I have seen for several materials in *Trigona (Meliponula) bocandei* Spin. and as Kerr and Krause (1950) report for *Melipona quadrifasciata* Lep. Also these pellets could be stolen and transported on the legs like cerumen and propolis.

Good reviews of the literature on robbing by several species of meliponines were made by Nogueira-Neto (1949) and by Schwarz (1948) but pillage of the sort found in *L. cubiceps* is not related. Robbing by *Lestri-*

melitta limão as described by Michener (1949) and Kerr (1951) is substantially similar to that of *L. cubiceps*.

Kerr (1951) observed a strong lemon smell inside the hives attacked by *L. limão* F. Smith. During the assaults of *L. cubiceps* Friese I noticed the odor common to this species, especially when bees were fighting, but I cannot say that there was such an odor inside the hives.

One problem remains in my mind: why do the *cassusso* bees pour honey? Would it be an active defense, closing the nest entrance, or a passive act, a kind of tax payment ("Take my honey but leave me in peace") which sometimes results in departure of the attackers without any serious damage to the *cassusso* colony?

As with the Brazilian species (Nogueira-Neto, 1949), the attacks of *L. cubiceps* can happen throughout the year.

ACKNOWLEDGMENTS

I want to thank Prof. J. S. Moure for the identification of *Lestrimelitta cubiceps* Friese and Dr. Charles D. Michener for identification of *Trigona braunsi* Kohl.

To Dr. Warwick Estevam Kerr, my many thanks for his help and encouragement during this work and for authorizing me to publish some of his observations made in Tanganyika.

Also, I wish to thank Dr. Michener for his interest in publishing these data and for putting this paper in readable English.

SUMMARY

Lestrimelitta cubiceps Friese of Africa is a robber bee which obtains most and perhaps all of its food as well as its propolis and cerumen from nests of *Trigona (Hypotrigona) braunsi* Kohl of the small variety called by the vernacular name *cassusso*. Groups of *L. cubiceps* enter and rob the *cassusso* nests, usually without great mortality to either the robber or robbed. The robbing requires several days, as the nest is usually closed to the robber by honey poured in the entrance by the *cassusso* for the first one, two, or three days. During this time the robbers are able to obtain only honey. Later, after they gain entrance to the nest, they take propolis, cerumen, and food from the larval cells, leaving many *cassusso* larvae to starve. If the robbing is repeated at frequent intervals, destruction of the *cassusso* colony results. The *Lestrimelitta* may also attack and kill all members of a *cassusso* colony at swarming time; the new *Lestrimelitta* colony then takes over the nesting place. There are only two other known species of *Lestrimelitta,* both found in the American tropics. One and probably both live by robbing, somewhat as does *L. cubiceps*.

The *Lestrimelitta* nests normally are found in cavities in branches and small tree trunks. They contain brood cells of quite variable size in clusters, not forming combs; queen cells are occasionally intermixed. There is no involucrum around the brood cells although thick semicurcular plates of cerumen are attached to the walls of the nest cavity in various positions. The storage pots are closely packed together and the outer walls of the groups of them are thickened so that an entire cluster of the pots can be lifted out of the nest together.

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SOME NEW STATE LEPIDOPTERA RECORDS FOR KANSAS

WILLIAM H. HOWE
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Some of the state records that follow have been included in the Season Summary issues of the Lepidopteris's News; others have not previously been published.

On October 19, 1955, I collected a single worn and frayed female of the Florida Purple Wing, *Eunica tatila* Herrich-Schaeffer in a pecan grove in Franklin County, Kansas. It is a tropical species which must have migrated from Mexico. The Gemmed Brown, *Euptychia (Megisto) gemma* Hübner was netted in 1946 in the low, humid Marais des Cygnes river valley and a single male was taken in a bait trap in the same locality on July 16, 1952. The latter was a newly emerged specimen, suggesting residence in the area.

Other records include: *Pholus labruscae* L., the Gaudy Sphinx, one male, at street light, 1949. *Erinnyis alope* Drury, a striking tropical sphinx, one female, on primrose, 1949. *Erinnyis obscura* Fabr., one male, in bait trap, 1946. *Darapsa pholus* Cramer, one female, on honeysuckle blossoms, near Ottawa, 1949. *Proserpinus juanita* Strecker, the southwestern desert sphinx (a day-flying species), one male, on alfalfa blossoms, June 8, 1948, one mile southwest of Ottawa, near the Sand Hills. *Sesia titan* Cramer, a tropical day-flying sphinx, one male, June, 1952, Ottawa, on spiderflowers *(Cleome)*.

Very rare catches and new state records among the Underwing Moths (Catocalinae) are the following: *Catocala parta* (Guenée), Ottawa, June, 1948, at willow sap; *C. amestris* (Strecker), Franklin County, June, 1952, bait trap; *C. coccinata* (Grote), Ottawa, June, 1948, at willow sap; *C. angusi* (Grote), Franklin County, June, 1956, bait trap; *C. consors* (Abbot and Smith), July, 1955, bait trap; and a single *C. murliercula* (Guenée), Franklin County, June, 1948, at willow tree sap.

Other notable catches, not necessarily new state records, include: *Hyloicus eremitoides* Strecker, the very rare Hermit Sphinx, one female, August 21, 1949, at lights at the entrance to Hoch Auditorium at the University of Kansas, collected by Robert Reiter. *Erebus odora* L., a migratory noctuid, June 22, 1949, near Ottawa, at willow tree sap in company with a host of Underwing Moths.

Among the migratory butterflies several noteworthy species have appeared in recent years, including *Phoebus agarithe* f. *maxima* Neumogen, the Giant Orange Sulfur, March 30, 1945, near Ottawa, flying due north. It was a worn, frayed specimen. Individuals of *Phoebus eubule* L., the common Migratory Sulfur, have been intercepted in the spring in a worn and faded condition, always flying northward, as does the Monarch, *Danaus plexippus* L. In the fall both species may be seen flying southward; *P. eubule* flies more southeastward and always individually, not in swarms.

One *Chlosyne lacinia adjutrix* Scudder was taken here on August 6, 1952. Its native range is extreme southern Texas and Mexico. A total of eight specimens of *Mestra amymone* Mènétriés were taken during the late summer and fall of 1950 in Franklin County. Their presence here was credited to a severe drouth in southern Texas. One specimen of *Danaus gilippus strigosa* Bates, the Striated Queen, was taken by Don Woodard in Lawrence along the banks of the Kansas River.

An outbreak of the common Thistle Butterfly, *Vanessa cardui* L., appeared here in June, 1945, in which thousands of the caterpillars could be seen defoliating roadside thistles. The plants were literally covered with the white webs of the caterpillars and the chrysalids could be seen attached to objects everywhere, leaving the characteristic red drops of "blood" where the adults emerged, paralleling the so-called "red rains" of Medieval Europe which so frightened the simple peasantry.

It is noteworthy that at least two butterfly species recorded for Kansas by Francis Huntington Snow have apparently not been seen or collected for nearly a hundred years. One of these is *Euphydryas phaeton* Drury, the Baltimore Checkerspot; the other, *Speyeria aphrodite alcestis* Edwards, the Ruddy Silverspot. If any collector finds either species anywhere in Kansas, the records would be of interest.

DESCRIPTIONS AND DISTRIBUTIONAL RECORDS OF AMERICAN MECOPTERA[1]

GEORGE W. BYERS

Among collections of Mecoptera examined during recent months are several interesting distributional records and four undescribed species. The new forms are from Panamá, Mexico and Virginia and include one species of *Kalobittacus,* one of *Bittacus* and two of *Panorpa.* The distributional data are for species of Panorpidae, Bittacidae and Boreidae.

Kalobittacus ramosus, new species

Description based on one male specimen originally preserved dried but now in alcohol.

Head: Eyes black, separated in front by about two thirds width of rostrum at base; vertex and occiput yellowish brown with a blackish area around ocelli; rostrum amber colored; antennal bases yellowish brown (flagella missing in holotype).

Thorax: Pleura pale yellowish brown, dorsum slightly darker; small blackened areas at ventral apices of mesepisternum and mesothoracic meron and along postero-dorsal margins of meso- and metathoracic mera; pronotum without conspicuous bristles; scattered hairs sparsely distributed on all sclerites, abundant only on coxae. Femora yellowish, those of the hind legs slightly incrassate (fig. 2); tibiae yellowish, narrowly darkened distally; tarsi dark on front and middle legs, first tarsal segment of hind legs yellowish, the others darkened.

Membrane of wings (fig. 1) faintly tinged with yellow; stigmata very dark brown; front wings with an irregular apical brown spot extending from about the tip of vein R_3 through all of cell 3rd R_4 to near the tip of vein M_1, also with spots over first fork of Rs, subcostal cross-vein, fork of R, and branching of M from Cu_1 (see fig. 1); hind wing with similar spots, the apical spot somewhat more extensive, with paler areas in cells 3rd R_3 and 2nd R_5, and with spots over subcostal cross-vein and branching of R fused. Vein 1A in front wing extending only as far as branching of M from Cu_1; 2A about two thirds as long as 1A. Vein 1A in hind wing coalescing with Cu_2 for most of its length, crossing to posterior margin of wing near level of branching of M from Cu_1; 2A sinuate, about one third as long as 1A; 3A apparently absent. No costal cross-vein.

Abdomen: Tergites and sternites yellowish brown, the membranous parts paler; tergites 2-6 bearing one or more long stout setae on lateral margins. Ninth segment greatly enlarged, the dorsal appendages of ninth tergite about twice the length of basistyles (fig. 4) sparsely covered with long hairs; tenth (anal) segment mostly membranous, its dorsal tip reaching the upper margins of the dorsal appendages. Dorsal appendages conspicuously branched, each with one elongate, somewhat flattened projection extending caudad, one similar projection curving ventrad, and two shorter, thicker projections, one of these roughly conical in shape, directed

[1] Contribution no. 1004 from the Department of Entomology, University of Kansas, Lawrence, Kansas.

mesad from dorsal margin and the other, rather wedge shaped, from the ventral margin of the appendage at about its mid-length. Latter two projections with black, slightly curved short spines on their mesal surfaces; caudal projection with a few scattered smaller spines. A small tubercle bearing two spines situated on inner face of appendage near base (indicated in fig. 3, together with ventral margin of appendage, by broken line). Aedeagus short, curving beneath 10th segment but not coiled.

Body length 16 mm.; front wing 15.7 mm.; hind wing 13.2 mm.

Holotype: male, collected in light trap operated by F. S. Blanton at Almirante, Bocas del Toro Province, Panamá (9°10′N; 82°28′W), 24 March 1953. The specimen is broken by having passed through the fan of the trap; one front wing, both antennae except their bases, and one leg are missing. The type is in the United States National Museum, Washington, D.C.

In spite of the condition of the specimen, it seems advisable to illustrate and describe this species because of its unusual qualities, particularly the pattern of spots on the wings and the remarkable ramification of the appendages of the ninth tergite. Among the Bittacidae, only a few species have the wings spotted in any way except for the stigma and marginal coloration along certain veins, *Nannobittacus elegans* Esben-Petersen and *Neobittacus blancheti* (Pictet) being unusual exceptions. I know only one other bittacid (*Bittacus burmanus* Tjeder) possessing such complicated dorsal appendages in the male; the specific name *"ramosus"* refers to this unusual condition.

Kalobittacus was described by Esben-Petersen in 1914 as a separate genus for a Mexican species, *K. bimaculatus* (also represented by a single male), having the venational peculiarities outlined above. This species has apical wing spots in addition to the stigmal spots but lacks any other maculation on the wings; its dorsal appendages are subrectangular in lateral profile, broadened in the distal one third. For forty years, the genus was known only from that specimen. In 1954, Riek pointed out that *Bittacus microcercus* Gerstaecker 1885, an Australian species, belonged in *Kalobittacus,* on the basis of the venation. This interpretation assumes that the genus *Kalobittacus* is a very old one, once widespread, and that the American and Australian forms are relict species of the ancient genus. An alternative explanation would be that the specialized venation, achieved by reduction and fusion of the more usual bittacid pattern, occurred independently in the two widely separated geographic areas. Dissimilarity of wing markings and male genitalial structures in the two groups tends to support the latter interpretation. It seems probable, on the other hand, that *Kalobittacus bimaculatus* and *K. ramosus* are closely related. Whether they should be in a genus apart from *Bittacus* is another matter.

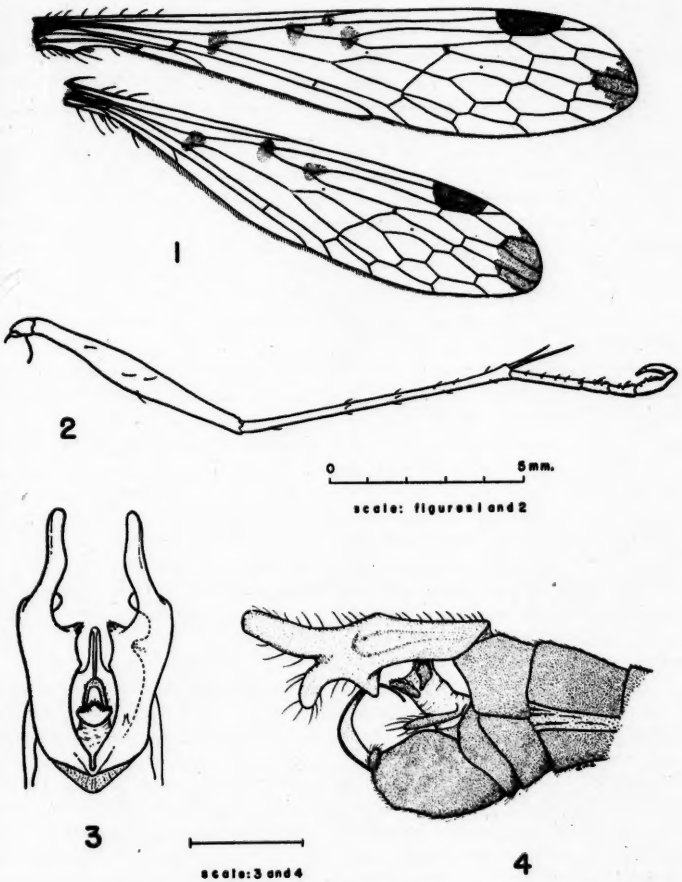
Bittacus panamensis new species

Description based on three males and one female originally preserved dry but now in alcohol.

Head: Eyes dark purplish brown to black; vertex and occiput brown with irregular black coloration around ocelli; rostrum brown, somewhat

darker above insertions of maxillary palps; palps dark brown; antennal bases brown, flagella grayish brown.

Thorax: Dorsum and pleura rather uniformly brown; pronotum with two or three heavy bristles on each side; a short, vertical row of two or



Figures 1-4. *Kalobittacus ramosus* new species. 1. right fore and hind wings of holotype male; 2. left metathoracic leg of holotype male, mesal aspect; 3. terminal abdominal structures of holotype male, dorsal aspect; 4. terminal abdominal structures of holotype male, right lateral aspect.

three bristles just anterior to metathoracic spiracle. Femora and tibiae brown, darkened at extreme tips; tarsi dark brown; hind femora slightly incrassate only in males.

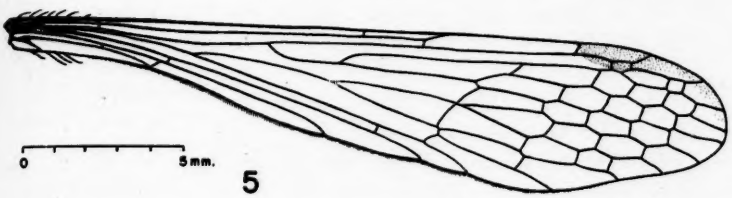
Membrane of wings (fig. 5) strongly tinted with yellowish brown, the stigma only a little darker; a faint clouding of brown extending from stigmal area around wing margin to near tip. Distal branches of radius and media connected by one more series of cross-veins than commonly found in the genus (fig. 5), as analyzed below.

Abdomen: Coloration uniformly brown. Dorsal appendages of ninth tergite of male roughly rectangular in lateral profile (fig. 7), bearing short blackened spines along dorsal and caudal margins on inner surface; a few longer spines on posterodorsal angle. Seen from above, space between appendages parallel-sided (fig. 6) with squarish anterior angles. A small patch of spines on ventral surface of basal portion of ninth tergite, indicated by broken line in fig. 6. Dististyles borne on narrowed elevations of basistyles; aedeagus thick at base, abruptly narrowed near mid-length, apical portion slender; tenth segment small, mostly concealed, exposed length of cerci only about one third as long as dorsal appendage. Cerci of female extending slightly beyond tip of slender tenth segment; terminal abdominal segments only a little expanded.

Body length, males, 19.0, 19.5 and 20.6 mm. (holotype); front wing, males, 20.4, 20.5 and 21.8 mm. (holotype), respectively. Body length, female, 16.5 mm.; front wing 18.8 mm.

Holotype: male, Penonomé, Coclé Province, Panamá (8°30′N; 80°18′ W), 23 November 1952. The specimen lacks parts of the front and middle legs and the flagellum of one antenna. Allotype: Las Tablas, Los Santos Province, Panamá, 24 October 1952. Paratypes: 1 male, El Cristo, Coclé Province, Panamá, 22 November 1952; 1 male, El Maria, Veraguas Province, Panamá, 14 July 1953. All specimens were taken at light traps operated by F. S. Blanton in connection with studies on *Culicoides*. Holotype, allotype and one paratype are in the United States National Museum, Washington, D.C.; one paratype (El Maria) in Snow Entomological Museum, University of Kansas, Lawrence, Kansas.

Bittacus panamensis is the second species of this genus to be found in Panama; *B. pignatelli* Navás, the other species, known from one female collected in Darien Province, has the more usual pattern of veins in the wing and several of the cross-veins darkly margined, as in *B. strigosus* of the United States. The nearest relatives of *B. panamensis* appear to be *Bittacus pintoi* Souza Lopes and Mangabeira, known only from southeastern Brazil, and *Bittacus flavescens* Klug, which has been found in Brazil and other parts of northern South America. From both these species, *Bittacus panamensis* differs in details of the male genitalia, the dorsal appendages of the ninth tergite being more squarely truncate than in either *pintoi* or *flavescens*. Also, the venation of the wing is markedly different because of the extra series of cross-veins in *B. panamensis*. Beyond the cord, the wing of *Bittacus panamensis* has two or three cells in area R_2, five in R_3, five in R_4, five in R_5, four in M_1 and four in M_2, while the corresponding numbers of cells in the wings of *B. pintoi*, *B. flavescens*, and most other *Bittacus*



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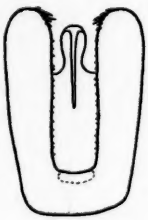

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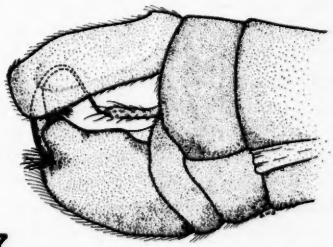

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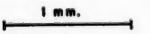

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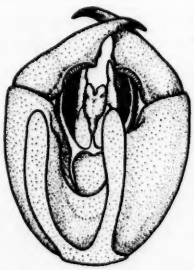

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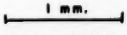

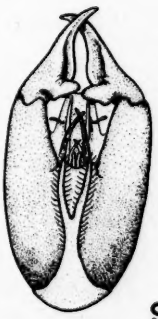

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Figures 5-7. *Bittacus panamensis* new species. 5. right fore wing of holotype male; 6. terminal abdominal structures of holotype male, dorsal aspect; 7. terminal abdominal structures of holotype male, right lateral aspect. Figure 8. *Panorpa palustris* new species, genital bulb of holotype male, posterior or ventral aspect. Figures 9-10. *Panorpa azteca* new species. 9. genital bulb of holotype male, posterior or ventral aspect; 10. genital plates of allotype female, ventral aspect.

are one or two in R_2, three in R_3, three or four in R_4 and R_5 and three in M_1 and M_2. *Bittacus geniculatus, B. chilensis* and *B. nebulosus,* species readily distinguishable from *B. panamensis* by various structural differences, have rather similar venation.

Panorpa palustris new species

Description based on two males, pinned.

Head: Eyes black; vertex, occiput, front and rostrum amber colored; no darkening around ocelli; antennal bases amber colored, the flagella dark gray.

Thorax: Pleura yellowish brown, the dorsum slightly darker. Bristles present on anterior edge of pronotum; thorax otherwise sparsely covered with pale, short hairs except on coxae, which bear longer hairs. Femora without blackened bristles except one or two near apex; tibiae with many dark bristles.

Membrane of wing with a yellowish tinge; apical band complete but with included pale areas; pterostigmal band interrupted; basal band represented only by spots on anterior and posterior margins of wing; first basal spot present, the second absent; one marginal spot present; all wing markings light brown. (Nomenclature follows Carpenter, 1931.)

Abdomen: Coloration yellowish brown; anal horn present on sixth abdominal tergite. Hypovalves extending to or slightly beyond bases of dististyles (fig. 8). Dististyles (forceps) simple, shallowly excavated on inner surface, their tips rather sharply curved. Ventral valves (hypomeres or parameres of authors) unbranched, slightly bowed and each with an inner row of elongate "barbs" and an outer row of short ones. Aedeagus bilobed at tip, situated between fingerlike projections (possibly epimeres).

Body length about 13.5 mm.; front wing 11.8 to 12.3 mm. (holotype 12.3 mm.).

Holotype: male, Cypress Chapel, Nansemond Co., Virginia, 13 Septemper 1934, L. K. Gloyd, no. 5. Paratype: male, same data as holotype. Mrs. Gloyd's notes describe the conditions at the time of collection as "at swamp pond in woods, at light, during rain." (The specific name of this *Panorpa* refers to its habitat, which is on the western edge of the Dismal Swamp.) Holotype and paratype are in the University of Michigan Museum of Zoology, Ann Arbor, Michigan.

Panorpa palustris will be identified as *P. claripennis* Hine by Carpenter's key (Carpenter, 1931, pp. 222-224), and in certain characteristics of the genitalia it resembles that species. However, the hypovalves are longer than those of *claripennis* and the dististyles are quite unlike those figured by Carpenter for *claripennis.* In addition, the yellowish coloration of the wings and presence of the marginal spot are distinguishing marks. Carpenter (1931, p. 248) states that *claripennis* "is a northern species . . . apparently single-brooded, and . . . disappears by the middle of July." *P. palustris,* on the other hand, occurs in the autumn, well south of the previously recorded range of *claripennis* (but see this species under "geographical distribution," below).

Panorpa azteca new species

Description based on two males and four females, pinned.

Head: Eyes dark brown to black; most of head yellowish brown in color, a diffuse brown band across vertex just above antennal bases; dark brown around ocelli; antennal bases yellowish, the flagella dark grayish brown; rostrum yellowish brown, slightly paler at base.

Thorax: Pleura yellowish brown to light brown; an irregular, dark brown band traversing pronotum at about its midlength; lateral shoulders of mesothoracic scutum dark brown, the central area paler; pronotum with twelve to sixteen bristles along anterior margin. Legs straw-yellow, darkened only at tips (fifth segments) of tarsi.

Wing membrane tinted with yellowish brown without markings of any kind; stigma inconspicuous.

Abdomen: Coloration yellowish brown to brown, darker in some specimens apparently because of fat content of body. Male without anal horn on sixth abdominal tergite; pre-epiproct (ninth tergite) elongate, tapering, shallowly emarginate at tip, without lateral lobes; hypovalves slender, acutely tipped, partly joined, forming a basal stalk of length about equal to that of separated portions (fig. 9), closely appressed to bilobed, membranous connection between basistyles; all appendages of aedeagus elongate, slender, with pointed tips; dististyles (forceps) each with a conspicuous, cup-like projection from posterior (ventral) surface and a strongly sclerotized tooth anterior to this, on mesal margin; tips of dististyles only slightly curved. Genital plate of female (fig. 10) with lateral projections prominent, parallel; anterior parts of plate and apodeme only weakly sclerotized.

Body length, male, about 9 mm.; female, about 11.5 mm. Length of front wing, male, 12.0 to 12.2 mm.; female, 12.0 to 12.6 mm. (holotype 12.2; allotype 12.5 mm.).

Holotype: male, Cañada Contreras, Distrito Federal, Mexico, 2900 meters, 14 June 1947, T. H. Hubbell no. 15. Allotype and three female paratypes: same data as holotype. Paratype: male, Desierto de los Leones, Distrito Federal, Mexico, 9800 feet elev., 18 July 1948, P. P. Dowling no. 18. Holotype, allotype and all female paratypes in University of Michigan Museum of Zoology, Ann Arbor, Michigan. Male paratype in Snow Entomological Museum, University of Kansas, Lawrence, Kansas.

This species shares many characteristics with *Panorpa immaculata* Esben-Petersen, a species recorded from Guerrero, and may eventually prove to be related to *immaculata* at the subspecific level. However, I have seen other Mexican specimens that agree with Esben-Petersen's description of *immaculata* in detail, and the two forms are distinct. *Panorpa azteca* has more darkly colored wings, and in the males the hypovalves are much longer (compare with illustration in Esben-Petersen, 1921, p. 73). The specific name is derived from the name Aztec, which is commonly used in reference to Indians of the Nahuatl tribe, once the dominant inhabitants of the region in which this species lives.

GEOGRAPHIC DISTRIBUTION

Since the publication of summaries of known distribution for North American Mecoptera in an earlier paper (Byers, 1954), several additional range extensions and other collection records of interest have been discovered. Most of these are state records that might well have been expected on the basis of distributional data already published; however, a few represent considerable extensions of previously known ranges. New state records are indicated by state names in small capitals. KU=Snow Entomological Museum, University of Kansas; UMMZ=University of Michigan Museum of Zoology.

PANORPIDAE

Panorpa claripennis Hine. FLORIDA, Gadsden Co., 3 miles east of Quincy, 29 March 1954, J. S. Rogers; 1 ♂ ; UMMZ; a new record for the state and for the southeastern part of the country, the southernmost previous record being from Ohio. The habitat is described as "along a small, sandy-bottomed stream through hammock vegetation."

Panorpa elaborata Carpenter. INDIANA, Tippecanoe Co., Lafayette, 6 July (no year), J. M. Aldrich; 1 ♀ det. F. M. Carpenter; KU; previously recorded from as far west as Ohio.

Panorpa immaculata Esben-Petersen. Mexico, MEXICO, 3 miles south of Bosencheve, San Cayetano Refuge, 18 July 1955, E. T. Hooper; 2 ♂ , one having faint coloration on the wings but both identified as this species on the basis of genital structure; UMMZ; previously recorded only from Guerrero (types).

Panorpa mexicana Banks. Mexico, PUEBLA, 3 miles east of Teziutlan, 26 June 1955, Univ. of Kansas Mexican Expedition; 1 ♀ with wing markings similar to those described by Banks is referred to this species; KU; previously recorded only from Orizaba, Vera Cruz (type).

Panorpa modesta Carpenter. Michigan, Cheboygan Co., 7 July and 8 August 1936, K. H. Kelly; 2 ♂ , with the broad lobes of the dististyles somewhat more smoothly rounded than illustrated by me in the 1954 paper cited above; NEW YORK, Hamilton Co., Blue Mountain Lake, 27 July 1946; R. H. Beamer; 2 ♂ ; all KU; previously known from Cheboygan Co., Michigan (type) and Pennsylvania. I am unable to distinguish females associated with males of this form (in UMMZ) from those of *P. signifer*.

Panorpa nuptialis Gerstaecker. OKLAHOMA, Choctaw Co., 1 October 1946; 1 ♀ ; KU; previously known from Texas, Kansas, etc.; this state locality is thus within the established range.

Panorpa submaculosa Carpenter. PENNSYLVANIA, Huntingdon Co., Huntingdon, 31 May 1935; 1 ♂ , teneral; KU; previously collected in New York, Ohio, etc.

Panorpa terminata Klug. Mexico, MICHOACAN, junction of highway 4 and Ruetamo Road, 15 miles east of Morelia, 8 July 1947, 2100 meters, T. H. Hubbell, no. 83; 3 ♂ ; UMMZ; known heretofore from Nayarit (Tepic).

Panorpa venosa Westwood. MISSOURI, McDonald Co., Goodman, 28 May 1950, R. H. Beamer; 1 ♂ ; KANSAS, Douglas Co., 20 April 1941, R. H. Beamer; 1 ♂ , 1 ♀ ; all KU; this species is widespread: New York, Georgia, Wisconsin, Utah, etc.

BITTACIDAE

Apterobittacus apterus (MacLachlan). COLORADO, La Plata Co., Durango, 19 May 1913, Oslar, collector; 1 ♂; UMMZ. This unusual locality record is included with some doubt, since the pin label reads "Durango, Col." One at first suspects this should read "Cal.," all other records for the species being from a rather limited area in California; however, I have not been able to find a Durango in California. The label is clearly printed, but there remains the possibility of an incorrect label having been attached to the specimen. Experience in other groups of insects, some even rather intensively studied, has shown that a species may sometimes be found far outside its previously known range. Therefore, while this locality for *Apterobittacus* will seem absurd to some entomologists, I prefer to withhold judgment for the present.

Bittacus banksi Esben-Petersen. Mexico, Jalisco, Puente Grande, 5000 ft., 20 August 1954, 1 ♂, and 20 miles southwest of Tepatitlan, 5500 ft., 20 August 1954, 1 ♀, both collected by University of Kansas Mexican Expedition; 27 miles east of Guadalajara, 10 September 1938, L. J. Lipovsky; 1 ♂; Guerrero, Acapulco, 23 August 1938, L. J. Lipovsky; 1 ♀; MORELOS, 12 miles east of Cuernavaca, 4300 ft., 14 August 1954, Univ. of Kansas Mexican Expedition; 1 ♀; all GU; HONDURAS, Depto. Morazan, Zamorano, 2600 ft., 15 July 1948, at light, T. H. Hubbell; 1 ♂; UMMZ; this species has been reported from several Mexican localities (Guerrero, Jalisco, Yucatan) and from El Salvador and Guatemala.

Bittacus mexicanus Klug. Mexico, SAN LUIS POTOSI, El Salto Falls, 16 June 1955 and 15 June 1956, R. E. Beer; 2 ♀; KU; El Salto, Río Narango valley, 2000 ft., 3 September 1948, P. P. Dowling; 1 ♂; UMMZ; OAXACA, 3 miles WNW of Tehuantepec, 200 ft., 16 August 1955, K. and A. Hooper; 1 ♀; UMMZ; I am not aware of any specific localities previously published for this species.

Bittacus pilicornis Westwood. FLORIDA, Leon Co., 5 May 1935, E. R. Bellamy; 1 ♂, 3 ♀; UMMZ; previously recorded from Georgia and northward.

Bittacus stigmaterus Say. MISSISSIPPI, Noxubee Co., Shuqualak, 16 July 1930, R. H. Beamer; 1 ♀; KU; Tennessee, Montgomery Co., Clarksville, 1 July 1939, R. H. Beamer; 1 ♂, 2 ♀; KU; a widespread species.

Bittacus strigosus Hagen. MANITOBA, Morris, 10 August 1937, R. H. Beamer; 2 ♀; KU; North Dakota, Emmons Co., Linton, 23 July 1937, C. L. Johnston; 1 ♂, 3 ♀; KU; this new North Dakota locality is about 125 miles west of those earlier reported and may be near the western edge of the species' range.

BOREIDAE

Boreus coloradensis Byers. UTAH, Cache Co., Blacksmith Fork Canyon, near Logan. Dr. George F. Knowlton has sent large numbers of male and female adults, many larvae in various stages of development, and mosses from which further specimens were extracted. The first series was collected between 28 October and 3 December 1956; a spring generation was sampled on 17 and 24 April 1957; and still further specimens were taken in No-

vember 1957. The habitat mosses, which I have identified as *Tortula ruralis* and *Brachythecium* sp., were growing on boulders and rock cliffs. MONTANA, Ravalli Co., Boulder Creek, on snow, 9 December 1956, R. Scott and W. L. Jellison; 2 ♂, 2 ♀; collected together with *Chionea* sp. (Tipulidae); KU. These two localities represent substantial extensions of the range of the species, which was earlier known only from Boulder Co., Colorado. As the type series was collected only in the spring months, I had suspected there was no early winter generation; however, both the Utah and Montana collections show this to be incorrect.

CORRECTIONS

Being abroad at the time of publication of my first paper on Mecoptera (Byers, 1954), I was unable to check the proof for errors. Certain of these require correction. Fig. 6, plate II (pupa of *Panorpa canadensis*) lacks a ridge of small spines along the posterior margin of the third abdominal tergite; the description on page 492 is correct. Under the heading "Distribution and Ecology," pages 493 ff., new state records are set in small capital letters, not in boldface type as indicated in the introductory paragraph. *Kalobittacus bimaculatus* Esben-Petersen was inadvertently omitted from the species list and should appear after *Bittacus texanus* on page 506. The other errors are typographical and easily recognized as such.

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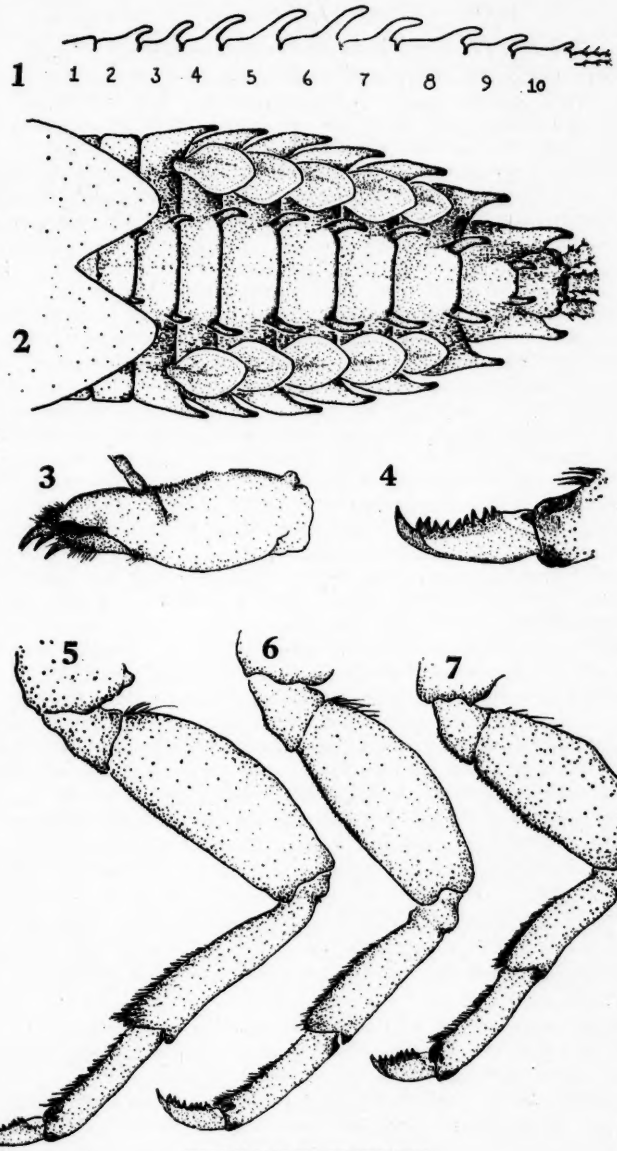
A NEW SPECIES OF EPHEMERELLA FROM GEORGIA (EPHEMEROPTERA:EPHEMERELLIDAE)

RICHARD K. ALLEN AND GEORGE F. EDMUNDS, JR.[1]
University of Utah

Through the kindness of Dr. Herbert H. Ross and Mrs. Leonora K. Gloyd of the Illinois State Natural History Survey, the authors received for study a collection of the mayfly genus *Ephemerella*. Included in this material was an undescribed species of the subgenus *Chitonophora* (= the *needhami* group of Traver, 1935, The Biology of Mayflies) represented by nymphs only. Dr. Lewis Berner of the University of Florida has loaned us additional nymphs of this species from Virginia. We take great pleasure in naming this species for Dr. Berner in recognition of his contributions to our knowledge of the mayflies of the Southeast. We would like to thank Mr. David I. Rasmussen for aid in inking the illustrations.

[1] The research on which this report is based was supported by grants from the University of Utah Research Fund and the National Science Foundation (NSF G 2514).



EXPLANATION OF FIGURES

Ephemerella berneri, mature female nymph, paratopotype. Fig. 1, profile of paired, dorsal, submedian abdominal spines. Fig. 2, dorsal view of abdomen. Fig. 3, left maxilla. Fig. 4, claw of foreleg. Fig. 5, left metathoracic leg. Fig. 6, left mesothoracic leg. Fig. 7, left prothoracic leg.

Ephemerella (Chitonophora) berneri, n. sp.

MATURE NYMPH (in alcohol). Length: body 11-13; tails 8-9 mm. Head light brown, posterior margin of head capsule narrowly dark brown; ventral margin of frons dark brown; labrum brown, lateral margins black; antennae brown at base, becoming paler apically. Pronotum light brown, lateral and posterior margins narrowly dark brown, anterior margin raised forming a deep furrow posterior to it. Mesothorax light brown; a low, angular, obtuse median tubercle situated between wing pads; two very low paramedian ridges anterior to this tubercle. Legs short and thick (figs. 5, 6, 7), light brown with a conspicuous ventral dark brown dot at each trochantero-femoral joint, larger brown spot at distal end of tarsi; claws light brown at base, dark brown at apex, with 8-10 denticles (fig. 3). Abdomen light brown with conspicuous, paired, dorsal, submedian spines on segments 2-10 (figs. 1 and 2); lateral margins of abdominal segments produced into long acuminate projections on segments 3-9 (fig. 2) which are darker brown apically; tergite 1 with only minute, paired, dorsal, submedian bumps; tergite 2 with long, well-defined, paired, dorsal, submedian spines; length of spines increases from tergites 2-6 and then decreases from 7-10 (fig. 1); bases of paired, dorsal, submedian spines widen from tergites 2-7 and then decrease in width on tergites 8-10; all paired, dorsal, submedian spines light brown at base and dark brown at apex (on some specimens the spines are longer than shown in figures 1 and 2, with the apices more recurved as seen in lateral view). Sternum light brown without conspicuous markings. Caudal filaments light brown and equal in length; sparsely setaceous at base, with longer setae distally on both sides of the filaments, but better developed on the mesal sides. (The tails of the developing adult show them to be narrowly banded with fuscous at each joining.)

Holotype: Male nymph, Flat Shoals, Flint River, 5.6 miles west Concord, Pike County, Georgia, 21-IV-39, P. W. Fattig, in collection of Illinois State Natural History Survey, Urbana. Paratopotypes: 1 female nymph in Illinois Natural History Survey, and 1 female nymph and 1 cast skin of female nymph in collection at University of Utah, Salt Lake City.

Paratypes: 1 male and 8 female nymphs, Piney River, Amherst Co., Virginia, 24-IV-53, Jean Pugh, 1 female nymph in collection University of Utah and all others in collection of University of Florida, Gainesville, Florida.

Remarks: *Ephemerella berneri* is a member of the subgenus *Chitonophora* and may be distinguished from all known species of this subgenus by the great development of the paired, dorsal, submedian abdominal spines on tergites 2-10.

Ephemerella berneri keys to *Ephemerella hystrix* Traver in Traver's keys (op. cit.). *Ephemerella hystrix*, however, does not belong in the subgenus *Chitonophora*. With *E. heterocaudata* McDunnough, *E. jacobi* McDunnough, and *E. columbiella* McDunnough, it forms a separate group which is distinguished in both the nymphal and adult stages by the fact that the median terminal filament is definitely longer and better developed than the lateral cerci.

NEW GENERA AND SPECIES OF NORTH AMERICAN TACHINIDAE (DIPTERA)[1]

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The new forms described below were encountered mainly during recent studies of materials submitted for identification by a number of collectors. Except where otherwise specified below, the primary types are retained by permission in my collection.

Dolichotarsus stipatus, n. sp.

A small slender black species; female abdomen compressed with anal segment elongated and deflexed, but at once distinguished from the genotype, *D. kingi* Brks., by the wholly black antennae and legs.

FEMALE. Head pollen gray on dark background; vertex 0.28 of head width, front gradually widened to antennal base; frontalia velvety black, wider than one parafrontal; proclinate ocellars small; two pairs of verticals and proclinate orbitals; frontals in a single row, two or three bristles below antennal base; bare, black arista thickened on basal fourth, thence slender to tip, basal segments short; parafacial narrow and bare; vibrissae on oral margin; facialia bare; proboscis short, labella soft-textured; palpus slender, yellow to brown; eye bare, not reaching vibrissal level; cheek one-fourth eye length; occiput clothed with black hairs above neck and pale below.

Thorax and scutellum dusted with gray pollen, which is interrupted on mesonotum by four black vittae, inner pair obsolete shortly behind suture. Chaetotaxy: acrostichal 1, 0 (far before suture); dorsocental 2, 3 (all except anterior one long); intraalar 2 (much smaller than dorsocentral); supraalar 1 (subequal to largest postalar); sternopleural 2 (sometimes an additional hairlike one present); pteropleural not developed; scutellum with two long lateral, apical and discal pairs reduced to hairs; postnotal slope setose; halteres yellow. Legs rather long and slender, subshiny black, coxae pale pollinose, claws and pulvilli short. Wing with a distinct brownish tinge becoming paler or grayish on hind margin; veins dark brown; first posterior cell narrowly open just before wing tip; costal spine minute; calypters whitish to pale tawny.

Abdomen black, last three segments with gray pollen extending about to middle on 2 and 3 but to hind margin on last; one pair of median marginals on proximal segments and a marginal row on last two; intermediate ones each with one pair of discals and two or three irregular rows of discals on last segment; genitalia tubular, telescopically retracted, not adapted for piercing.

Length, 4-4.5 mm.

Male unknown.

Holotype: W. slope Popocatepetl, 9600 ft. Mexico, July 5, 1951 (P. D. Hurd). Paratype: 1 female, same data as type.

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Dolichotarsus livescens, n. sp.

Essentially as in the preceding species, except as follows:

FEMALE. Palpus pale yellow, distinctly enlarged and bowed upwards on apical half; thorax somewhat discolored in the single specimen but apparently not strongly vittate above; femora and tibiae with an obscure reddish tinge in ground color; intermediate abdominal segments with heavier gray pollen above extending well behind middle of each; wing clear or paler, veins including costa yellow; first posterior cell closed at costa near extreme wing tip; costal spine approximating one-half length of small crossvein.

Length, 5 mm.

Male unknown.

Holotype: "Milagro, N.M., June 23, 1941."

Evidomyia, n. gen.

A small fly with the general features of *Eucoronimyia*, genotype *hastata* Coq., but the facialia practically bare, second aristal segment at most three times longer than wide; frontal profile subequal in length to facial; intermediate abdominal segments without discals.

Head about one-half wider than high, face receding in profile with epistoma rather strongly bowed forward from clypeal plane, vibrissal axis subequal to antennal; latter well above eye middle; front broad, vertex slightly over two-fifths head width in both sexes; frontals rather weak, in a single row diverging anteriorly, one or two bristles beneath antennal base; verticals two pairs, male without orbitals; ocellar bristles rather weak but distinct, laterally divaricate; haustellum one and one-half to two times head height, labella very slender; palpus spatulate, subequal to length of third antennal segment; vibrissae not decussate, on oral margin near lower edge of head; parafacial bare; antenna reaching lower fourth of face, third segment in male uncommonly broad; arista bare, thickened to a tapering sharp tip, second segment at most three times longer than wide; eye bare, nearly vertical, reaching to vibrissal level; cheek one-fifth eye length; occiput flat to slightly concave. Thoracic chaetotaxy: acrostichal 1 or 2, 2; dorsocentral 2, 3; intraalar 3; supraalar 3; presutural 1 (outer); notopleural 2; humeral 2-3; sternopleural 2; pteropleural 1 (small); scutellum with 2 lateral, 1 equally large decussate apical and 1 small or hairlike discal pair; postnotal slope and prosternum bare. Legs rather slender but not very long, weakly bristled; male claws and pulvilli barely equal length of last tarsal segment, considerably smaller in female. Wing reaching a little beyond tip of abdomen; first posterior cell narrowly open shortly before wing tip; costal spine vestigial. Abdomen long ovate in male, more broadly so in female; segment one without median marginal bristles, one pair on second and a marginal row on segments three and four, besides a discal row on last, discals normally absent on intermediate segments; sternites covered.

Type species: *Evidomyia infida*, n. sp.

Evidomyia infida, n. sp.

MALE. Head pollen silvery becoming cinereous on occiput; frontalia ob-

scured by pollen, much narrower than parafrontal; latter clothed with erect fine black hairs outside of frontal row; antenna entirely black, proximal segments short, third about four times longer than second and broadly rounded at apex; palpus black, devoid of any bristly hairs; occiput rather sparsely clothed with short black hairs.

Thorax black, gray pollinose, notum marked with four rather broad and well defined black vittae; scutellum black dusted with changeable gray pollen. Legs shining black; mid tibia with one weak submedian anterolateral bristle, hind tibia not ciliate. Wing clear; first vein bare, third with one or two minute setulae near base; last section of fifth vein one-third length of preceding; calypter opaque white.

Abdomen black, segments two to four gray pollinose above, with apical fourth or more of each including entire first segment shining black; hypopygium caudoventral, fused forceps short and tapering to an acute tip; fifth sternite black.

FEMALE. Third antennal segment much narrower or ordinary in size; abdomen wider than thorax and broadly ovate; genitalia retracted; otherwise as in male.

Length, 4.5-6 mm.

Holotype male and allotype female, "12 mi. S E Ivanpah, San Berna. Co., Calif., 11-1-1956, C. Vasbauer." Paratype: 1 male, Palms, Calif., III-29-41, without collector's label.

Parcipromus, n. gen.

Habitus similar to *Sipholeskia*, but much smaller in build, haustellum not exceeding head height and the eyes thinly short-haired.

Head wider than high, frontal profile nearly as long as concave facial, epistoma strongly produced subnasutely; oral margin axis distinctly longer than antennal, which is shortly above eye middle; clypeus flush, about twice longer than wide; parafacial bare, well narrowed downward; facialia flattened or not raised above clypeal plane and practically bare; two pairs of vertical bristles in both sexes, inner decussate; proclinate orbitals one pair in male and two in female; ocellars small but distinct, proclinate; frontal row slightly irregular anteriorly in male, three or four bristles below antennal base; antenna nearly as long as face; arista micropubescent, proximal segments short; palpus slender, slightly enlarged at tip; haustellum rather slender, micro setose, labella small but soft-textured; eye slightly oblique, reaching about to vibrissal level; cheek one-fourth eye length; occiput moderately convex and somewhat produced rearward at middle on lower extremity. Thoracic chaetotaxy: humeral 3; presutural 1 (outer); supraalar 3; intraalar 3; dorsocentral 3, 3; acrostichal 2, 1 or 2; sternopleural 3; pteropleural 1 (small); scutellum with 2 lateral and 1 weak discal pair behind middle; apicals absent; prosternum and propleuron bare; postnotal slope sparsely setose. Abdomen ovate, broadly so in female; second segment with one pair of median marginal bristles and a marginal row on three and four; intermediate segments each with one pair of discals in both sexes besides one pair (sometimes irregular) on fourth in female; sternites covered.

Type species: *Parcipromus silus*, n. sp.

Parcipromus silus, n. sp.

MALE. Vertex 0.29 of head width, front widening gradually and evenly forward into facial angle; head pollen pale yellowish gray on dark background, which becomes paler or reddish on cheek including lower part of face; brown frontalia equibroad to triangle and subequal to parafrontal width; antennal segments one and two red, third sharply contrasting black, broad to rounded apex; arista black, moderately thickened on basal two-fifths thence tapered to a fine tip; vibrissae a trifle above oral margin, with three or four hairs next above same on facialia; cheek sparsely beset with coarse black hairs; palpus yellow bearing a few black bristlets near tip; haustellum shining brown, rather slender but not very long; occiput with two rows of black hairs behind eye above and a thin vestiture of short pale hairs extending to lower margin.

Thorax black, moderately heavy yellowish gray pollen on mesonotum interrupted by four narrow but well defined black vittae; scutellum with similar pollen but on a reddish ground color apically. Legs reddish yellow (tarsi infuscated or blackish), rather weakly bristled; front tibia with two posterolateral and the mid tibia with one submedian anterolateral bristle; hind tibia not ciliated; claws and pulvilli small. Wing subhyaline with a faint tawny tinge becoming grayish on hind margin; first posterior cell narrowly open a trifle before exact wing tip; hind crossvein oblique, joining fourth its length from rounded cubitulus, which about twice length of small crossvein from hind margin; first vein bare, third with one longish spinule near base; costal spine hardly equal to length of small crossvein; calypters tawny white, semitransparent.

Abdomen black, anal segment including genitalia wholly red in ground color; entire upper surface of last three segments dusted with grayish pollen which is somewhat changeable with angle of view; fifth sternite red, with a V-shaped median apical excision, lobes beset with a few fine black hairs.

FEMALE. Vertex 0.31 of head width; frontalia red, barely equal to parafrontal width at mid front; third antennal segment narrower and reddish at least to base of arista; eyes less distinctly haired than in male; femora infuscated except on apical half of ventral margin; last segment of fore tarsus slightly swollen and broader than preceding; claws and pulvilli minute.

Length, 5.5-6 mm.

Holotype male, Agua Verde Bay, Baja Calif. Mexico, March 26, 1953, Sefton Orca Exped. (P. H. Arnaud). Allotype female, Deep Springs, Inyo Co. Calif., July 11, 1953 (J. W. MacSwain). Paratype: 1 female, same data as allotype except dated July 17, 1953.

Mactomyia, n. gen.

Habitus similar to *Dichocera*, type *lyrata* Will., but the clypeus moderately to deeply depressed; facialia ciliate to or above level of lower frontals; male antenna simple, etc.

Head one-third wider than high, squared below, occipital and facial profile subparallel, latter nearly one third longer than frontal; oral margin

axis equal to antennal, which is well above eye middle; epistoma nearly equal to width of clypeus and bowed forward from plane of same; short, non-decussate vibrissae on oral margin; frontals in a single row descending to mid face level on parafacial, which is bare below; proclinate ocellars and two pairs of verticals differentiated but no orbitals in male; eye thickly pilose; cheek three-fifths eye length; male antenna rather strikingly elongated, with first segment exceeding length of second and middle aristal segment about one fourth as long as third; female antenna ordinary in size, with much shorter proximal aristal segments; proboscis not exceeding head height, labella fleshy but not very large, palpus slender, over one-half length of haustellum. Thoracic chaetotaxy: acrostichal 3, 3; dorsocentral 3, 3; intraalar 3; supraalar 3; notopleural 2; presutural 1 (outer); sternopleural 2; pteropleural 1-2 (rather small); scutellum with 3 lateral, 1 weak decussate apical, no well developed discal pair but usually with several erect bristly hairs; prosternum, propleuron and postnotal slope bare. Legs average in length, weakly bristled; female tarsi somewhat stouter than in male. Wing normal in size; first posterior cell closed, petiole nearly twice length of small crossvein; cubitulus with a strong stump; costal spine vestigial.

Abdomen broadly ovate in both sexes, bristling weak and variable in spacing; one pair of median marginal bristles on second segment, marginal row on last two but incomplete on third, discals in irregular series on intermediate segments and scattered on upper surface of last; sternites exposed.

Type species: *Mactomyia fracida,* n. sp.

Mactomyia fracida, n. sp.

MALE. Head silver pollinose on dark background; frontalia reddish, at middle a little wider than parafrontal; vertex 0.29 of head width; facialia vertical, beset with short infraclinate bristles to upper third or above; antenna black, third segment eight to ten times length of second; bare, black arista thickened on proximal three fourths thence tapered to a fine tip; palpus brownish basally, tip paler or yellow; cheek black, feebly shining, clothed with fine black hairs; occiput subshiny black, bearing a rather thick ruff of pale pile.

Thorax and scutellum black, lightly sprinkled with gray pollen leaving surface of mesonotum and pleura moderately shining in most views, dorsal vittae not very well defined. Legs black; hind tibia not ciliated, middle tibia with two smallish anterolateral bristles; claws and pulvilli not quite equal length of apical tarsal segment. Wing gray hyaline; third vein setose near base and sometimes halfway to small crossvein; hind crossvein oblique, a little over half its length from cubitulus; calypters semitransparent white; epaulet and subepaulet infuscated.

Abdomen black, last three segments above with changeable gray pollen on basal half interrupted along median line; hypopygium black, caudoventral; fused forceps narrow from base to rounded apex and thin in profile; accessory process wide on basal half, tapering to a narrow or subacute apex; penis rather short, considerably swollen and vaselike distally, reflexed apical margin notched on median anterior extremity and bearing a small pale

membranous lobe on opposite side behind; fifth sternite lobes rather small, separated apically by a V-shaped excision.

FEMALE. Vertex 0.30 of head width, front widening gradually to antennal base; parafrontal blackish and moderately shiny; antenna much smaller than in male, third segment not over five times length of second and first shorter than same; arista rather short, thickened about to middle, second segment barely longer than wide; clypeus not so deeply depressed, facialia ciliate on lower three fifths; claws and pulvilli short.

Length: male 5.5-7 mm.; female 7 mm.

Holotype male, Globe, Arizona, March 20, 1937 (Parker); allotype female, "Ventura, Calif., May 13, 1944." Paratypes: 1 male, Taos Co. New Mexico, E. of Taos 9000 ft., August 25, 1940 (C. W. Sabrosky) and 1 male, Logan Canyon, Utah, June 4, 1954 (G. E. Bohart), flower of *Lomatium*.

Imaguncula, n. gen.

Similar to *Olenochaeta* (type, *kansensis* Tns.) in most essential details but with parafacials distinctly haired from lowermost frontals to cheek grooves.

Eyes bare, reaching slightly below oral margin; cheek one-eighth eye length; clypeus well depressed, widening slightly below, epistoma bowed forward from plane of same; facialia weakly ciliate on lower half or less; vibrissae on oral margin, decussate at tips; parafacial well narrowed downward; antenna subequal to length of face, third segment two-fifths (female) to three and one-half (male) times longer than second; short arista bare, thickened to a tapered sharp tip, second segment three to four times longer than wide; palpus slender, with upcurved tip slightly thickened; proboscis short but rather slender. Thoracic chaetotaxy: acrostichal 2 or 3, 3; dorsocentral 3, 4; intraalar 3; supraalar 3; presutural 2; posthumeral 2; humeral 2-3; pteropleural 1 (smaller than sternopleural); postalar 2; intrapostalar well differentiated; sternopleural 4; scutellum with 3 lateral, 1 small preapical and 1 appressed hairlike discal pair; prosternum setose at sides; postnotal slope bare. Abdomen obovate, barely wider than thorax; second segment with one pair of median marginal bristles, third and fourth each with a marginal row; sternites covered.

Type species: *Imaguncula tabida*, n. sp.

Imaguncula tabida, n. sp.

MALE. Head pollen subsilvery; front at vertex 0.36 and at antennal base 0.44 of head width; verticals two pairs; ocellars reclinate; parafrontal wider than frontalia, bearing a row of reclinate bristles outside frontal row; latter set on outer margin of frontalia, with two or three bristles below antennal base; antennal segments one and two yellow, third infuscated and subequal width of parafacial at vibrissal level; palpus yellow; occiput flat to slightly concave, gray pollinose, clothed with a vestiture of sparse short white hairs.

Thorax and scutellum black, rather evenly gray pollinose; notum marked with four more or less distinct dark vittae; fringe of anterior spiracle brownish to black. Legs black, weakly bristled; hind tibia ciliate on outer posterior side, mid tibia with two median anterolateral bristles;

claws and pulvilli slightly longer than apical tarsal segment. Wing hyaline, extending a little beyond tip of abdomen; first posterior cell narrowly open to closed at costa; cubitulus rectangular, without stump or fold; apical crossvein strongly transverse; hind crossvein oblique and bicurved; costal spine vestigial; third vein bearing two or three setulae near base.

Abdomen black, last three segments above entirely pale cinereous with narrow hind margin of each appearing darker in some views; genital segments small and retracted; fifth sternite black, with an apical U-shaped excision, lobes small.

FEMALE. Vertex 0.39 of head width; parafrontal more or less yellowish above middle, usually with an incomplete row of bristles outside main frontals; second antennal segment much longer than in male, tinged with yellow; claws and pulvilli small.

Length, 5-8 mm.

Holotype male and allotype female, Tucson, Arizona, August 16, 1925. Paratypes: 1 male, 21 mi. N of Pearce, Cochise Co., Arizona, July 8, 1955 (G. D. Butler and J. G. Werner) and 1 female, Sycamore Canyon, Ataso Mts., Arizona, Aug. 27, 1954 (G. D. Butler); 2 females, Cuernavaca, Mexico, June 28, 1939, without collector's label.

Spallanzania colludens, n. sp.

Allied to *S. pansa* Snow, but averaging much smaller in build, parafacial barely exceeding clypeal width, ocellars directed laterally or nonreclinate; outer verticals absent in male, etc.

MALE. Head pollen gray, usually with a yellowish sheen on parafrontal; frontals in two rows, inner diverging anteriorly, two or three bristles beneath antennal base; parafacial with three or four irregular rows of black bristly hairs extending from lower frontals to cheek groove; facialia practically bare; vibrissae shortly above oral margin; red frontalia barely equal parafrontal width at mid front; proclinate orbitals absent; front at vertex 0.30 of head width, equibroad on upper third thence widening rapidly into facial angle; cheek one-third eye length; antennal segments one and two red, third black, one and one-half to two times length of second; bare arista short, middle segment two times longer than wide; palpus yellow, bowed upwards and slightly thickened apically; occiput cinereous, clothed with pale pile.

Thorax black, gray pollinose, dorsal vittae not well defined, scutellum largely reddish and thinly pale pruinose. Chaetotaxy: acrostichal 3, 3; dorsocentral 3, 4; intraalar 3; supraalar 3; presutural 2; humeral 3-4; pteropleural 2-3 (small); sternopleural 4; notopleural 3 (intermediate one small); scutellum with 3 lateral, 1 appressed discal behind middle and usually 1 unpaired preapical bristle; prosternum bristled; propleuron and postnotal slope bare. Legs black, hind tibia ciliate, preceding one with a row of uneven anterolateral bristles; claws and pulvilli longer than apical tarsal segment. Wing hyaline, veins yellow, third with two to four setulae near base; first posterior cell narrowly open well before wing tip; costa without a well-developed spine and setulae becoming obsolete beyond apex of second vein; epaulet and subepaulet blackish; calypters opaque white.

Abdomen black with a reddish tinge in ground color at sides, last three segments dusted with gray pollen, which in favorable view extends thinly to hind margin of each; one pair of median marginal bristles on basal segments (usually small on first) and a marginal row on segments three and four, plus a discal row on last set far behind middle; hypopygium small, black; forceps short and stoutish, divided apically but not divergent; fifth sternite black, with a deep median apical excision, lobes largely retracted.

FEMALE. Similar to male except for the usual sexual differences.

Length, 7-9 mm.

Holotype male and allotype female, College Station, Texas, October 19 and 29, 1933 (H. J. Reinhard). Paratypes: 4 males and 2 females same data as type; 1 female, Fairfax, South Carolina, May 7, 1935 (E. W. Howe); 3 males, Douglas, Arizona, August, without collector's label.

Belvosia mira, n. sp.

A rather striking species with abdomen entirely golden pollinose; parafacials with fine pale hairs on upper half; arista flattened, subequal to length of third antennal segment.

FEMALE. Head pollen white to silvery on pale background, becoming yellowish and thinner on parafrontal; latter sparsely clothed with fine black hairs; frontalia yellow, narrowed upwards and extending to vertex on either side of triangle; frontals in three irregular rows, the main row widely divergent on parafacial beneath antennal base; two or three proclinate and one reclinate orbital bristles and two pairs of verticals; ocellars absent; antenna mostly reddish, third segment infuscated on anterior half or more and seven times longer than second; arista micro pubescent, middle segment twice as long as wide; facialia beset with stout infraclinate bristles nearly to aristal level and pale-haired outside of latter; vibrissae not far above oral margin; cheek pale pilose, one-fourth eye length; proboscis short, labella fleshy; palpus yellow, thickened apically, beset with short coarse black bristles; occiput cinerous, with a rather thick vestiture of pale hairs.

Thorax black, with moderately thick yellowish gray pollen above, marked with four narrow black vittae before suture and five behind; mesonotal vestiture black but pleura entirely pale pilose, with the hairs long and crinkly on hind margin of mesopleura and on pteropleura; latter bearing two stout macrochaetae, sternopleura with four; prosternum pale setose at sides. Legs subshiny black; mid tibia with a row of uneven bristles on outer front side; claws and pulvilli short. Wing gray hyaline tinged with yellow costobasally; epaulet and subepaulet rufous; calypters pale yellow, opaque.

Abdomen black with reddish tinge in ground color at sides of two basal segments and venter of same; pollen on all segments extending to hind margin of each; one pair of medium marginal bristles on first two segments and marginal row on last two.

Length, 11.5 mm.

Male unknown.

Holotype: Tehuantepec, Oaxaca, Mexico, July 21, 1952 (E. E. Gilbert, C. D. MacNeil), in the California Academy of Sciences Collection.

A NEW ERIOPHYID MITE FROM KANSAS[1]

C. C. HALL, JR.

The recent interest in Eriophyid mites, especially in their plant virus disease transmission relationships, has increased the urgency for the recognition of their true identities and for providing names for the purpose of precise reference. It is with this in mind that this paper, which describes a species that is closely related to and often confused with *Aceria tulipae* (Keifer), has been prepared.

Aceria slykhuisi, n. sp.

Female 190-237μ long, 38-42μ wide, opaque white, body wormlike and slightly arched in lateral view. Rostrum 17μ long, curved downward. Shield 36μ long, 35-38μ wide; median line extending from middle of shield to posterior margin of shield; admedian lines usually complete, posteriorly indistinct in some; submedian lines incomplete, broken, about four present. Dorsal tubercles and setae present; tubercles 19-23μ apart; dorsal setae 48-54μ long. Forelegs 29-30μ long; femur, genu, and tibia each bearing a seta; tarsus with three setae, claw, and featherclaw; claw as long as featherclaw, featherclaw 6-rayed. Hind legs 26-28μ long; femur and genu each bearing a seta; tarsus bearing three setae, claw and featherclaw; featherclaw 6-rayed plus a terminal ray. Abdomen with 70-75 rings; microtubercles ovoid, equidistant from anterior and posterior limits of annular ring. Lateral setae 37-38μ long; first ventral setae 50-60μ long; second ventral setae 12-18μ long; third ventral setae 24-25μ long; accessory setae absent. Genital coverflap with seven or eight longitudinal scorelines, occasionally less than seven scorelines present but never with more than eight.

Male 170-180μ long, 44μ wide. Genital coverflap and apodemes as in plate I, figures 5 and 6.

Type locality: Kansas Agricultural Experiment Station (Fort Hays Branch Station at Hays, Kansas), Ellis County, Kansas. Collected: August 12, 1954, by T. L. Harvey, Assistant Entomologist at Fort Hays Branch Station, Hays, Kansas. Type material: Holotype female, allotype male, 10 paratype female slides, plus five slides with numerous mites (males and females on each slide) are in the Snow Entomological Museum, University of Kansas. Ten paratype slides have been sent to the United States National Museum, Washington, D.C. Paratypes will also be sent to Mr. H. H. Keifer, Bureau of Entomology, 1220 N Street, Sacramento, California. Host: *Buchloe dactyloides* (Nutt.), buffalo grass.

Relation to the host is not clear. The stunting or witchbrooming seems to be due primarily to the feeding of the eriophyid mites, but almost as soon as these abnormalities are noticed, mites of the family Tarsonemidae appear and often become as numerous or more numerous than the eriophyids. The tarsonemid mites seemed to persist longer than the eriophyids. The abnormal growth or witchbrooming appears to be restricted to pistillate plants. Two test plots of grass at the Fort Hays Experiment Station showed very convincingly that these mites are chiefly found on and cause abnormal

[1] Contribution no. 1028 from the Department of Entomology, University of Kansas.

PLATE I

Aceria slykhuisi, n. sp. 1, Adult female, lateral view. 2, Internal female genitalia. 3, Genital coverflap of female. 4, Female shield, dorsal view. 5, Internal male genitalia. 6, Genital coverflap of male. 7, Side skin structure, *Aceria slykhuisi*. 8, Left legs. 9, Featherclaw. 10, Side skin structure, *Aceria tulipae* (K.).

growth of female plants. At the Experiment Station the stunted tufts of grass (witchbrooms) were very numerous in the female plants that were separated from a strip of staminate plants by only a few inches, the latter showing no growth deformities.

This species differs from *Aceria tulipae* (K.), the most closely related species, in being more slender, having fewer scorelines on the female genital coverflap, and in the position of the microtubercles which are centrally located in the abdominal rings in *Aceria slykhuisi* and are situated nearer the posterior margins of the abdominal rings in *Aceria tulipae*. Figures 7 and 10 show the above differences in microtubercles as seen in lateral view. The featherclaw of the new species is 6-rayed; that of *A. tulipae* is 7-rayed.

This species is named for Dr. J. T. Slykhuis who stimulated much interest in this family of mites by his discovery of the role of the closely related species, *A. tulipae* (K.), as the vector of wheat-streak mosaic virus.

I appreciate very much the help of Mr. T. L. Harvey of the Kansas Agricultural Experiment Station, Fort Hays Branch Station, who has been most cooperative in collecting material and providing information about reports of that station. I also wish to thank Dr. Robert E. Beer of the Department of Entomology, University of Kansas, for his encouragement during a study of Kansas Eriophyid mites and for checking the manuscript of this paper.

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TYPES OF MOSQUITOES DESCRIBED BY C. F. ADAMS IN 1903 (DIPTERA, CULICIDAE)

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C. F. Adams described three new species of mosquitoes collected in August at an elevation of 6,000 feet in Oak Creek Canyon, Arizona, by F. H. Snow. Through the kindness of C. D. Michener and G. W. Byers, the type material of these species at the University of Kansas was loaned to the U. S. National Museum. The purpose of this paper is to select lectotypes for two of the species and propose three new synonymies. Adams' names will be treated under *Culex peus* Speiser, *Culex apicalis* Adams, and *Culiseta particeps* (Adams).

Culex (Culex) peus Speiser

Culex affinis Adams, 1903, Kansas Univ. Sci. Bul. 2:25 (*nec* Stephens 1825).
Culex peus Speiser, 1904, Insekten-börse 21:148.
Culex stigmatosoma Dyar, 1907, U.S. Nat. Mus. Proc. 32:123 (new synonymy).

Culex affinis Adams was described from a single female. This specimen is in fair condition with only two legs missing. There are no lines or spots of pale scales along the anterior surfaces of the femora or tibiae and it is clear that this type specimen is not *Culex tarsalis* Coquillett, with which it has been synonymized. The specimen bears the label, "*Culex stigmatosoma* Det. Bohart 1950," and I believe this to be correct zoologically although not nomenclatorially. A comparison with the type of *Culex stigmatosoma* shows minor differences, but I do not believe these to be sufficient to warrant separate treatment. The type of *affinis* is smaller, with a wing length of 3.5 mm. instead of a length of 4.5 mm. for the type of *stigmatosoma*. The palpi of *affinis* lack white scales apically and the tarsal bands are slightly narrower and the dark portions of the legs slightly paler than in the type of *stigmatosoma*. Since Speiser proposed the name *Culex peus* to replace the preoccupied *C. affinis* Adams, *nec* Stephens, this then becomes the valid name of the species and the later *C. stigmatosoma* falls into synonymy.

Culex (Neoculex) apicalis Adams

Culex apicalis Adams, 1903, Kansas Univ. Sci. Bul. 2:26. Bohart, 1948, Ent. Soc. Amer. Ann. 41:336.

The two female syntypes of this species are in poor condition, one of them consisting only of the thorax, wing, and one leg. Bohart, in revising the subgenus *Neoculex* in America north of Mexico, states, "Type: female, Univ. Kansas," but he did not select or label one of the two syntypes as a lectotype. I do this now, choosing the better of the two specimens. This specimen lacks most of the proboscis, both wings, both hind legs, both mid-tibiae, and one fore tarsus. This is presumably the specimen Bohart examined, and it agrees, as far as its condition permits, with Bohart's description of the species.

Culiseta (Culiseta) particeps (Adams)

Culex particeps Adams, 1903, Kansas Univ. Sci. Bul. 2:26.
Culiseta maccrackenae Dyar and Knab, 1906, Biol. Soc. Washington Proc. 19:133 (new synonymy).
Culiseta dugesi Dyar and Knab, 1906, Biol. Soc. Washington Proc. 19:134 (new synonymy).

The original material of this species consisted of one male and six females. Three females and the male were received from Kansas University. All bear the same data as given in my opening sentence, agreeing with all the other type specimens received from Kansas University. Two female types loaned me by the New York State Museum are labeled somewhat differently, the data being, "S. Arizona, F. H. Snow, Aug. 1902." I do not know where the sixth female is. All the specimens from Kansas University are in good condition, and all prove to be the same as *Culiseta maccrackenae* Dyar and Knab, and not *C. incidens* (Thomson) under which *particeps* has been synonymized. The crossveins are abundantly scaled, the femora have definite subapical rings of white scales, and the pale bands on the

tarsi are rather broad, that of the second hind tarsomere being one fourth of the total length. Of the two New York State Museum specimens, one is also the same as *C. maccrackenae* and the other is *C. incidens*.

The selection of a lectotype presents a problem. If the single specimen in the New York State Museum which is *C. incidens* were to be selected, then there would be no new synonymy or name change involved. This at first glance would seem the logical thing to do, but there are several reasons for not doing so. They are:

1. Certain characters given in the original description agree with five of the syntypes of *particeps* but not with the sixth syntype. These are, with the diagnostic characters here italicized, "palpi brown, *base of each joint white;—femora black*, with the posterior side *on basal* half, and a *ring near apex white-scaled;*—a spot at the origin of the second vein, the small cross-vein, and a spot beginning at the base of the first submarginal and crossing the second submarginal and first posterior cells, *clouded with brown.*—petiole of the first submarginal cell *one-half* the length of the cell." Of particular importance is the leg coloration, quite different in the two. There are other characters less tangible, such as the more abundant white scales on the fore part of the wing, which points towards the *"maccrackenae"* series rather than the single *incidens*. It is evident that Adams was describing the former.

2. On a numerical basis it would seem better to select the species represented by five specimens rather than the species represented by one.

3. All the specimens from Kansas University were the same, and all bear the same data as the other Adams types of this paper.

For these reasons I select one of the females from the University of Kansas collection as the lectoholotype, and the other five specimens as lectoparatypes, one of the latter in the New York State Museum belonging to the species *Culiseta incidens*.

A NEW SPECIES OF *HORVATHINIA* FROM BOLIVIA (Belostomatidae:Hemiptera)

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The following description of a new species of *Horvathinia* is supplementary to a recent monograph of the genus by Jose A. DeCarlo (1958) [Indentificatión de las especies del género *Horvathinia* Montandon. Descripcion de tres especies nuevas (Hemiptera-Belostomatidae). Rev. Soc. Ent. Arg. 10:45-52] and is based on a specimen that was obtained by exchange with the Zoologische Sammlung des Bayerischen Staates in Munich. *Horvathinia* is a very rare genus. Of the eight species heretofore known, only nine specimens were listed by DeCarlo.

Horvathinia forsteri, n. sp.

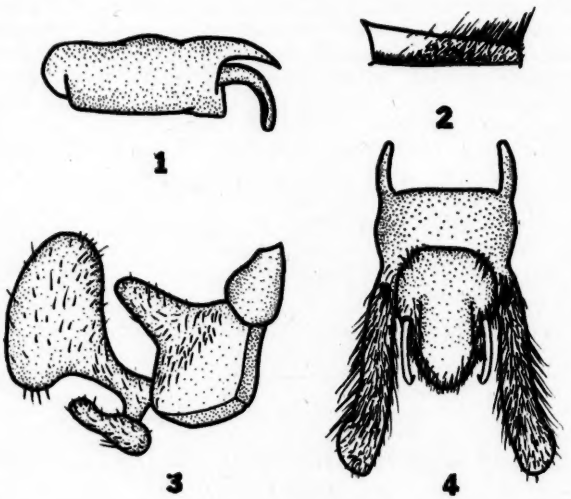
(Figs. 1, 2, 3, and 4)

Sex. Male.

Size. Total length, 26.8 mm.; maximum width, 15.2 mm.

Color. General color brown. Head and pronotum mottled with dark brown punctae; pronotum with two dark fossae, posterior and lateral margins of pronotum fulvous; anterior half of scutellum dark chocolate; legs uniformly russet.

Structural Characteristics. Eyes triangular, projecting slightly beyond the anterior margins of the prothorax; maximum interocular space approximately one-half the greatest width of the head. Ratio of the segments of the rostrum to the first segment of the beak 1:2:1.6. Antennae (fig. 3) with second segment truncate ventrad, third segment narrowly constricted at the base, and with a distinct petiole bearing the fourth segment.



Prosternal carina (fig. 2) distinct but not projecting cephalad, with long silky hairs at base; scutellum rugose, without setae or hairs. Hemelytra sparsely covered with setae; corium with six longitudinal veins; membrane with eight veins. Forefemora robust, width slightly less than one-third greater than width of the hind femora; ventral surfaces of meso- and metafemora with yellow pile in longitudinal sulcus. Vestiture of connexivum sharply divided into an inner band of yellow pile and an outer band of stout setae. Genitalia and genital capsule as in figures 1 and 4, respectively.

Comparative notes. *H. forsteri* differs from the five known species of *Horvathinia* by its proportionally broader size. The shape of the antennae and prosternal keel distinguishes *H. forsteri* from *H. pelleranoi* De Carlo,

1930, *H. dellojuradoi* De Carlo, 1930, *H. castilloi* De Carlo, 1938, and *H. meyeri* De Carlo, 1938. The corium of *H. forsteri* has eight longitudinal veins while that of *H. pelocoroides* Mont., 1911 has only three.[1]

Type. Known only from the male holotype which will be placed in the Collection of the Zoologische Sammlung des Bayerischen Staates, Munich, Germany.

Locality. The holotype bears the following label: Chapare-Gebiet, Oberer Rio Chipiri, 400m., 5.11.53, Bolivia. It was collected by Dr. W. Forster.

It gives me great pleasure to name this new species of *Horvathinia* after the collector, Dr. Forster, director of entomology in the Zoologische Sammlung des Bayerischen Staates in Munich, Germany.

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Montandon, A. L. 1911. Deux genres nouveaux d'Hydrocorises. Ann. Mus. Nat. Hung. 9:244-250.

[1] The monograph of DeCarlo (1958), which I just received describes three additional species. These may all be distinguished from *H. forsteri* by the shape of the prosternal keel.

A NEW SPECIES OF MALLOPHAGA FROM THE BAND-TAILED PIGEON

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AND
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A new chewing louse collected off the Band-tailed Pigeon in British Columbia is herewith described.

Physconelloides spenceri n. sp.

MALE. Head 0.40 mm. in length and 0.61 mm. in breadth. Ventral, anterior spine-like processes of forehead as in *P. zenaidurae* (McGregor). Lateral, preantennal spine-like processes longer than in *P. zenaidurae,* but shorter than in *P. passerinae* Emerson. Chaetotaxy, except for terminal abdominal segments, as in *P. zenaidurae.* Chaetotaxy of genital opening as shown in figure 4. The male genitalia do not appear to be distinctive.

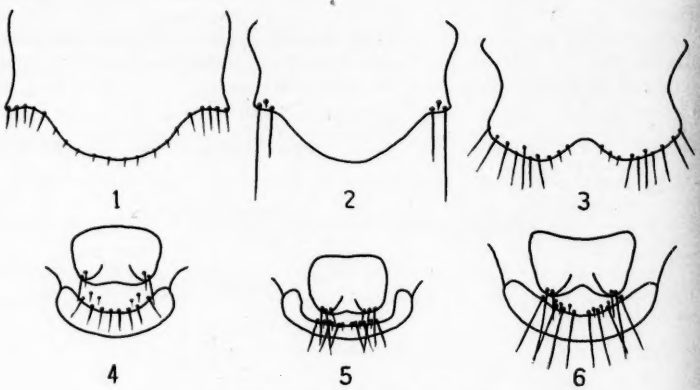
FEMALE. Head 0.48 mm. in length and 0.70 mm. in breadth. Spine-like processes of the head as in the male. Chaetotaxy, except for terminal abdominal segments, as in *P. zenaidurae.* Chaetotaxy of vulva as shown in figure 1.

Type host: *Columba fasciata fasciata* Say, Band-tailed Pigeon.

Type material: Holotype male, allotype female, and sixteen paratypes collected at Vancouver, British Columbia, by Professor G. J. Spencer on

October 6, 1952. Fourteen paratypes were collected at Tofino, on Vancouver Island, British Columbia, by Professor G. J. Spencer on August 26, 1926.

The holotype and allotype have been deposited in the U. S. National Museum. Paratypes have been deposited in the British Museum (N H), the Canadian National Collection of Insects, the Chicago Natural History Museum, and the Snow Entomological Museum at the University of Kansas.



EXPLANATION OF FIGURES

Figures 1-3. Vulva region of female, *Physconelloides* species. Fig. 1. *P. spenceri* n. sp. Fig. 2. *P. zenaidurae* (McGregor). Fig. 3. *P. passerinae* Emerson,

Fig. 4-6. Genital region of male, *Physconelloides* species. Fig. 4. *P. spenceri* n. sp. Fig. 5. *P. zenaidurae* (McGregor). Fig. 6. *P. passerinae* Emerson. Figures 1-6 drawn to the same scale.

The chaetotaxy and shape of the female vulva offers the best means of identification. For the three species of this genus known from North American hosts, this structure has been illustrated to show these differences. Considerable differences in size between the three species are also apparent. Average total length of mounted specimens for the three are:

Species	Male	Female
P. passerinae Emerson	1.42 mm.	1.75 mm.
P. spenceri n. sp.	1.28	1.64
P. zenaidurae (McGregor)	0.97	1.58

LITERATURE CITED

Emerson, K. C. 1957. A new species of Mallophaga from a Dove. Jour. Kans. Ent. Soc., 30:36-38.

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CONTENTS OF THIS NUMBER

The Genus *Esakia* Lundblad with Two New Species
HERBERT B. HUNGERFORD AND RYUICHI MATSUDA 193

A New Species of *Eurytoma* Illiger, Parasitic on the Nantucket Pine Moth, *Rhyacionia frustrana* (Comstock) and the European Pine Shoot Moth, *R. buoliana* (Schiffermuller) (Hymenoptera: Eurytomidae; Lepidoptera: Olethreutidae)
ROBERT E. BUGBEE 197

Corn Earworm Moth Repellents
JAMES E. ROBERTS AND L. H. ROLSTON 200

A Contribution to the Bionomics of *Lestrimelitta cubiceps* (Hymenoptera, Apidae)
VIRGILIO DE PORTUGAL-ARAÚJO 203

Some New State Lepidoptera Records for Kansas
WILLIAM H. HOWE 211

Descriptions and Distributional Records of American Mecoptera
GEORGE W. BYERS 213

A New Species of *Ephemerella* from Georgia (Ephemeroptera: Ephemerellidae)
RICHARD K. ALLEN AND GEORGE F. EDMUNDS, JR. 222

New Genera and Species of North American Tachinidae (Diptera)
H. J. REINHARD 225

A New Eriophyid Mite from Kansas
C. C. HALL, JR. 233

Types of Mosquitoes Described by C. F. Adams in 1903 (Diptera, Culicidae)
ALAN STONE 235

A New Species of *Horvathinia* from Bolivia (Belostomatidae: Hemiptera)
DAVID R. LAUCK 237

A New Species of Mallophaga from the Band-Tailed Pigeon
K. C. EMERSON AND RONALD A. WARD 239